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PROGRAMS

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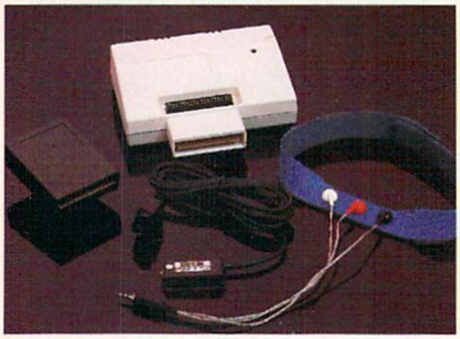
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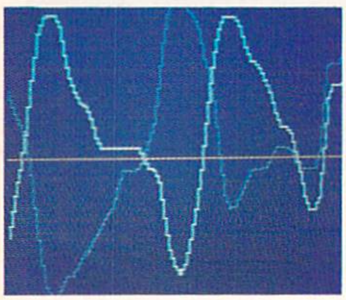
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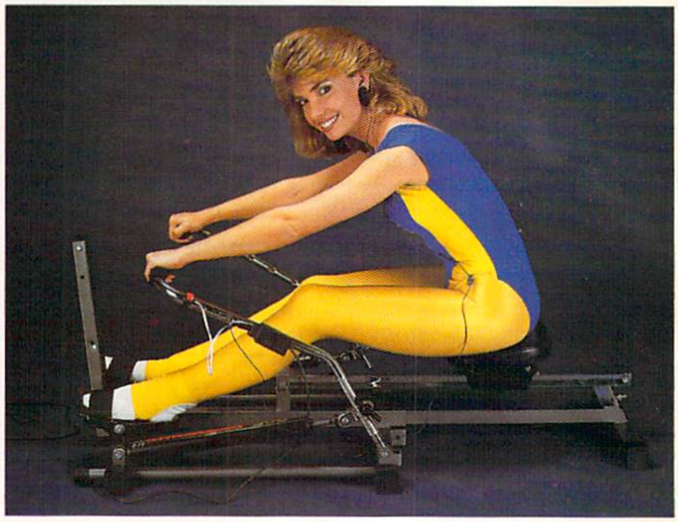
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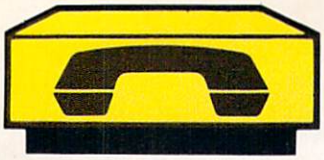
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The Software Delivery Service has a Trading Post for selling self-written software and a Public Domain Library where thousands of programs are available for downloading.



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VIEW FROM THE BRIDGE

Once again, *Ahoy!* has gone up against the toughest review board in the Commodore market—that of Benn Dunnington's *INFO* Magazine—and come out smelling like a rose! Certain other magazines came out smelling more like a substance found at the other end of a rose...but we'll let you read about that on page 97.

Right now, we're more interested in boasting about the premium offered with this month's *Ahoy! Disk:* all the software you need to get online with PlayNET and enjoy two free hours of the popular bulletin board system's games and other services! You can read more about what PlayNET has to offer in the ad on the facing page; and for details on ordering the December *Ahoy! Disk*, see page 87.

Finally, and best of all, let's crow about the contents of this issue of *Ahoy!:*

- While serious computer artists will have already purchased one of the excellent sketching programs for the 128, the recreational doodler may find his palate and pocketbook suited by *The Artist.* In addition to supporting a range of drawing features, the program is easily expanded to do even more. (Turn to page 34.)
- As if the filthy peasant rabble weren't revolting enough, they're now really revolting—and your armies must stop them in *Rebels and Lords.* (Turn to page 96).
- We finally realized why we didn't get more letters praising *LazyBASIC* in our June '86 issue. The sloths who most appreciated this shorthand entry program were too lazy to write us! With that in mind, Michael Bennett comes back with *Lazy Source Code* in this issue. (Turn to page 88.)
- We won't say Tony Brantner's *Speedway* is exciting—but the burning rubber you smell may not be due to power of suggestion. It may come from grinding your sneaker heel against the imaginary brake on the floor! (Turn to page 78.)
- Continuing his one-man mission to add every feature to the C-64 that its designers left out, Buck Childress presents *The Editor,* providing 64 users with many of the screen editing features that the C-128 offers—and some that it doesn't. (Turn to page 56.)
- Rapidly becoming to *Ahoy!* games what Buck is to *Ahoy!* utilities, Cleveland Blakemore makes his monthly appearance with *Minotaur Maze,* placing the mythological beasts in their classic habitat. (Turn to page 52.)
- The next best thing to living in a Tom and Jerry cartoon, *Mouse in the House* enables you and a friend to play a classic game of cat and mouse. (Turn to page 55.)
- But besting rodents and felines will seem like cake compared to your mission to outbox the nine toughest members of the street gang that's taken over *Micro City.* (Turn to page 76.)
- Dale Rupert continues his series on 128 data management with an explanation of creating and using relative files. Even if you've never used them, this month's *Rupert Report* will turn you into a *File Manipulator!* (Turn to page 20.)
- Mark Andrews continues delving into regions of the 128 where no writer has gone before, devoting this month's *Commodore Roots* to the "shadow registers" so useful for sprite programming, yet so mysteriously overlooked by the *C-128 Reference Guide.* (Turn to page 27.)
- In addition to a roster of the latest gridiron games for the Commodore, this month's *Entertainment Software Section* introduces a new semi-regular feature: *Under Construction,* designed to help users get the most out of the growing genre of screen editor-equipped recreations. Also included this month are reviews of *Macbeth, Elite, Ultimate Wizard,* and the *Arc of Yesod/Nodes of Yesod* dual disk. (Turn to page 41.)
- Morton Kevelson details a construction project of a more real world variety as he tells you how to *Build a Five Volt Peripheral Power Supply.* (Turn to page 92.)
- Cheryl Peterson recommends ways for beginning computerists to put St. Nick to best advantage with a *Cadet's Column* compendium of *Christmas Presents for You and Your Commodore.* (Turn to page 100.)

But you're holding the best $2.75 stocking stuffer we know of—or so the reviews tell us. Next month's third anniversary issue will be packed fuller with surprises than Santa's sleigh. If you miss an occasional issue of *Ahoy!,* make sure that January '87 is not one of those issues!

—David Allikas



"I don't care how versatile it is...you can't charge this dinner on your multifunction card!"

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Gamco Industries, Inc., 800-351-1404; in TX 915-267-6327 (see address list, page 14).

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Tensoft, 800-828-1829; in CA 800-626-6126 (see address list, page 14).

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CBS Interactive Learning (see address list, page 14).

Spellbound ($14.95) allows the parent or teacher to create any word list desired. The student can be tested on his ability to copy the word, to type the word from memory after seeing it on the 64 screen, and to correctly type a word when it appears onscreen in scrambled order. For an additional $10, a site license is available permitting the making of unlimited additional copies for use within a school.

Roberts Information Systems, 503-447-6275 (see address list, page 14).

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Readup Inc., 715-887-2333 (see address list, page 14).



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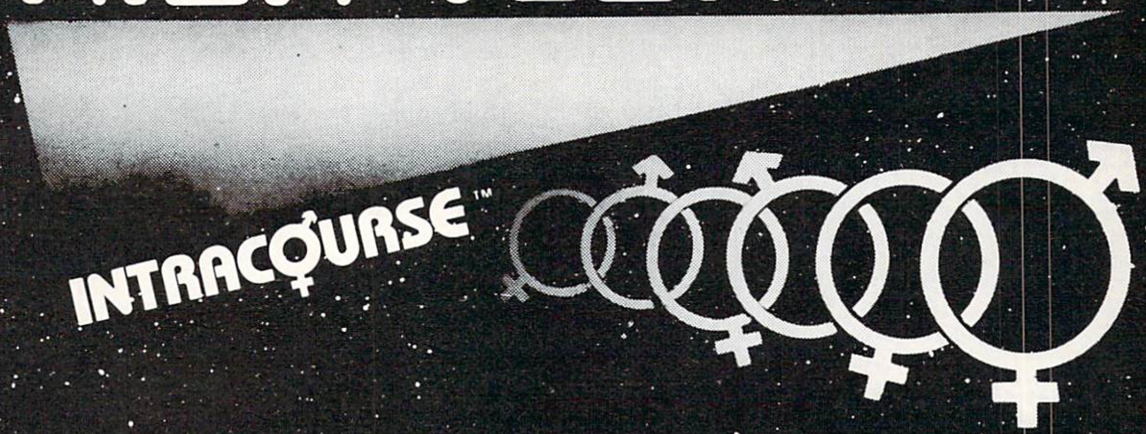
A BH100 is included in the Complete Beginner's I/O Interface Course ($159), along with an illustrated course manual ($15 separately) and a Beginner's Module, a circuit board that piggybacks onto the BH100 and adds eight LED's, eight switches, and a relay for switching applications.

Also available is the BH100-S Security System Module ($25), which adds to the BH100 everything needed for an eight zone security system, including software and a 120 dB siren.

And finally from II/O, 8-bit Analog to Digital Conversion Modules, available in 1 channel ($30) and 8 channel ($45) versions, which plug into the BH100 and automatically digitize an analog input signal (0-5VDC) and read it into memory.

Intelligent I/O, Inc., 315-265-6350 (see address list, page 14).

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The Computer Club (see address list, page 14).

BOOKS

New from Howard W. Sams:

The 656-page *Commodore 128 Reference Guide for Programmers* ($19.95) covers BASIC, assembly language, 40- and 80-column text programming, graphics, and details of the operating system.

By *Ahoy!* columnist Mark Andrews and incorporating material previously covered in *Commodore Roots, Commodore 128 Assembly Language Programming* ($15.95) concentrates on the 128 assembler with a focus on programming, uses for its special features, and details of its memory configuration.

Organized as a troubleshooting guide, *Computer Connection Mysteries Solved* ($15.95) allows users to deal with a variety of system configurations. Theory and technical information is provided, but simple solutions are presented early.

The second edition of *Experiments in Artificial Intelligence for Microcomputers* ($14.95), containing 75% more material and many new chapters, provides details on applying AI to practical activities. BASIC programs for the 64 are included.

Howard W. Sams & Co. (see address list, page 14).

A revised edition of *1001 Things to Do with Your Commodore 128* ($12.45 paperback, $18.95 hardbound) includes programs for sound and graphics, games, and financial, business, and educational applications.

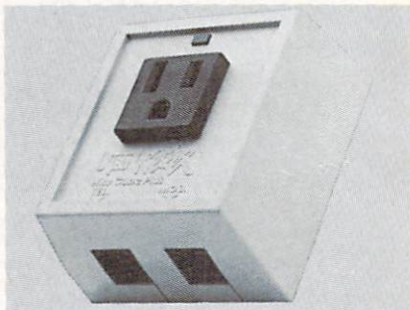
TAB Books Inc., 717-794-2191 (see address list, page 14).



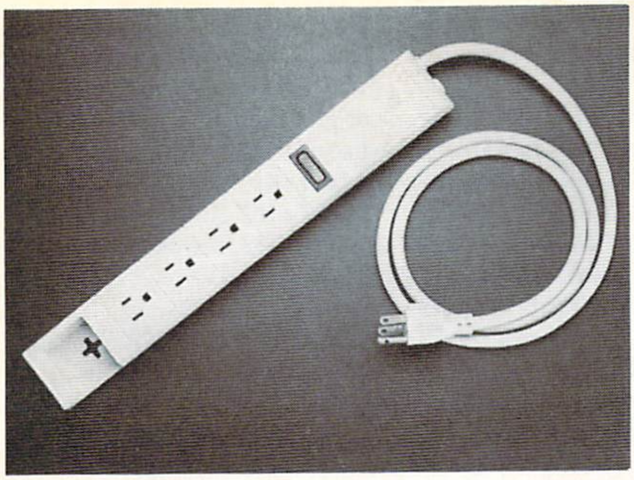
This month's manuals from Sams & Co.
READER SERVICE NO. 253

SURGE PROTECTORS

MicroComputer Accessories' six-



Wire Cube Plus: modem protection.
READER SERVICE NO. 254



Designed to defend against damage and data loss caused by power surges, spikes, and noise interference, MCA's Surge Protector cuts power in under 1 nanosecond. READER SERVICE NO. 255

outlet Surge Protector ($39.95) protects computer systems from damage and data loss caused by power surges, spikes, and noise interference. The unit's circuit breaker cuts power in less than 1 nanosecond; the reset button reactivates the system.

MicroComputer Accessories, Inc., 213-301-9400 (see address list, page 14).

Networx's single-outlet Wire Cube Plus ($39.95) defends against spikes and surges, and prevents disruption of modem operation by shunting harmful energy on modem lines to ground.

Networx, 718-821-7555 (see address list, page 14).

CHARACTER GENERATOR

Intended for the professional video market, *Pro Video CG I* ($199.95) works with the Amiga to create a character generation production tool supposedly comparable to dedicated systems costing thousands of dollars. The software provides various text styles, character shadow and edging, and 32K+ of text memory.

JDK Images, 612-854-7793 (see address list, page 14).

64, 128, AMIGA GAMES

Two C-64 games from Activision based on licensed characters, each $34.95:

Those stars of toy store shelves and Saturday morning TV make it to the C-64 screen in *Transformers—Battle to Save the Earth,* requiring the player to help the Autobots thwart the Decepticons' scheme to destroy the world. Autobot characters include Rodimus Prime, Kup, Cliffjumper, Hound, Hotrod, Pipes, and Bumblebee, each with his own particular strengths and attributes that must be matched to each battle.

Based on the Jim Henson-directed film and developed by Lucasfilm Games, *Labyrinth: The Computer Game* is an animated adventure that places you in the clutches of the evil Goblin King. He has promised you your freedom if you can escape his Labyrinth, a twisting maze of paths and passageways, within 13 hours. You'll encounter friends and foes along the way, including the Fireys, Ludo, Hoggle, and Sir Didymus, while visiting locations like the Bog of Eternal Stench, the Wise Man's Garden, and the Hall of Stone Faces.

Activision, Inc., 415-960-0410 (see address list, page 14).

The Amiga version of The Software Toolworks' *The Chessmaster 2000* ($44.95), covered in last month's *Scuttlebutt* (page 10), will be distributed through Electronic Arts' Affiliated Labels program.

Electronic Arts, 415-571-7171 (see address list, page 14).

A text-based interactive novella, *The Adventure of the Vatican Cameos* ($32.95) requires the player as Sherlock Holmes to navigate through over 60 locations in search of the solution to a mystery. The first player to find the correct solution will receive $1000.

Ellicott Creek Software (see address list, page 14).

Bridge Baron ($49.95) has been enhanced to include hints, computer scoring in rubber bridge fashion, au-

COMAL Starters Kit
$29.95 plus $4 shipping

5 Disks* including:
- 1541 Fast Loader
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$24.95 Comal Today subscriber price --- $29.95 regular price. 16K chip plugs into empty socket of COMAL 2.0 cartridge. Adds:

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- Over 100 added commands

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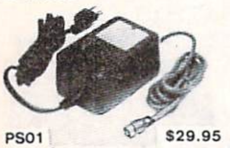


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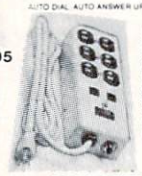
UL LISTED EXTRA POWER TO TAKE CARE EXTRA LOADS AND HEATING PROBLEMS BEATS THE ORIGINAL

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300 Baud Modem $29.95



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Surge Protected & Noise Filtered Power Center.
(PO01) $55.95



PO01

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DATA SETTE DC01 $19.95



FUNCTION SAME AS VIC 1530 EXCEPT THE PRICE

(PO02) $14.95

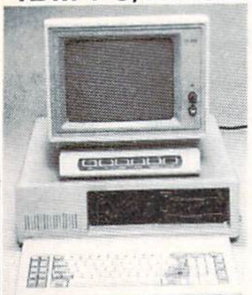


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IBM PC/XT CLONE $599.



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Reader Service No. 262

tomatic play, strong or weak two-bids, and switching sides to replay deals.

Great Game Products, 301-365-3297 (see address list, page 14).

Bear Graphics Software has released three games that can be played via modem without additional software: *Trapdoor Checkers* (each player gets two trapdoors that can be sprung anytime), *Radical Chess* (if a player lands on the computer-selected radical square, it is exchanged for a piece from the discard), and *Seabattle* (similar to *Battleship*). Players can type messages to each other on a scrolling text bar during a game. For the 64; $24.95 each.

Bear Graphics Software (see address list, page 14).

Also playable on two computers at separate locations via modem, *Battle Command* ($20.00) offers a different playing field for each game and a variety of game options definable by the player.

Applied Computer Consultants, 612-827-2425 (see address list, page 14).

SubLOGIC's long and eagerly awaited *Flight Simulator II* ($49.95) for the Amiga features 120 airports in New York, Chicago, Seattle, Los Angeles, and San Francisco. Players can fly in day, dusk, or night, and control such environmental factors as cloud layers, fog, winds, and turbulence. Also included are full instrumentation, with VOR, ILS, ADF, and DME avionics, multiple 3-D window views with aspect ratio and zoom control, and multiple viewpoints including cockpit, tower, map, and spot-plane. Two or more players using separate machines can fly together via modem port connectors.

SubLOGIC, 217-359-8482; orders 800-637-4983 (see address list, page 14).

ASTROLOGY PROGRAM

Basing its calculations on true astrological principles, Dynacomp's *Mr. Astrologer* ($29.95) enables C-64 users to prepare natal horoscopes, and answer questions about and chart previews for any future date up to the year 1990. The program will profile the positive and negative characteristics of any person born between 1920 and 1990.

A free software catalog is available on request from Dynacomp, 716-671-6160 (see address list, page 14).

SERIAL INTERFACE

Omnitronix's new Serial Printer Interface ($79.95) circumvents software incompatibility problems by connecting to the Commodore serial bus, not to the user I/O port like most serial interfaces. DIP switches permit selection of baud rates in eight increments from 75 to 19200, word, parity, and Xon/Xoff handshaking. All standard Commodore printers commands and secondary address printing modes are supported. Power is provided through the cassette port or an optional power supply.

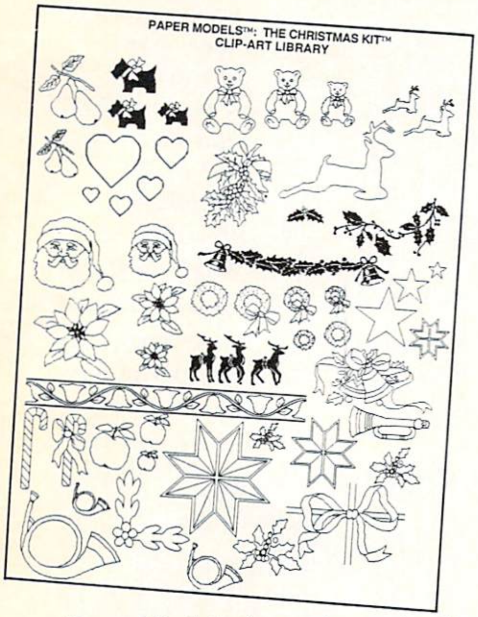


Commodore users can fully interface and adapt serial RS232 printers with the Serial Printer Interface from Omnitronix, supplying full voltage levels on standard RS232 pins. READER SERVICE NO. 256

Omnitronix, Inc., 206-236-2983 (see address list, page 14).

XMAS ORNAMENT MAKER

Paper Models: The Christmas Kit



Paper Models: ***home decorating kit.***
READER SERVICE NO. 257

($24.95) permits C-64 users to create Christmas ornaments and decorations. Patterns can be selected and printed out from a collection of holiday items such as gift boxes, toy trains, sleighs, and complete Dickens-style villages. Included is a gluestick and ruler, marking pens, and 10 sheets of card stock.

Activision, Inc., 415-960-0410 (see address list, page 14).

BIBLE ON DISK

Intended as a serious Bible study tool for C-64 users, *Landmark 1.0* ($179.95) contains the entire King James version on 20 double-sided disks. Users can view any part of the Bible (each chapter of each book is in an individual file), access references for any verse or chapter, outline text in colors, keep permanent notes, search a chapter, book, or entire Testament for up to 12 phrases at a time, and copy scripture from any part of the Bible. The main program, written entirely in machine language, completely fills the 64's memory. Accessories, including a concordance, are planned.

Bible Bytes (see address list, page 14).

3-D GRAPHICS FOR 64

Perspectives II ($59.95) permits the C-64 user to create and manipulate 3-D images onscreen. Objects can be viewed from any horizontal or vertical position. By manipulating objects and capturing the individual screens in frames, an animated filmstrip can be created. The program can be driven by joystick, mouse, graphics pad, or light pen. 2-D images can be exchanged with popular graphics programs.

KIRA Corporation, 215-683-5699 (see address list, page 14).

PHOTO-SCANNING SYSTEM

The Scammadore photo-scanning system ($54.95) consists of a scanning head that is attached to any typewriter and connected to the 64 or 128 user port. With the picture to be scanned inserted in the typewriter, the user hits the typewriter space bar on program cue, and the picture is scanned line by line. The resulting printout lacks the realism of output from more expensive systems, but experimentation with the included customizing programs can yield some interesting results. The scanhead alone is priced at $39.95; software $14.95; demo disk $5.00.

Kaltek Labs, 809-829-4220 (see address list, page 14).

TERM PAPER WRITER

The latest release in Activision's Personal Choice line, *Term Paper Writer* ($59.95) for the C-128 consists of four modules that help the student organize his notes and format and write his paper. The Notetaker, an electronic card file, facilitates the collection of information by source and topic. The Outliner permits the organization of ideas into topical groups. The Writer is a full-featured word processor. The Footnoter and Bibliography Compiler inserts footnotes on appropriate pages and compiled information for the bibliography directly from The Notetaker. But you may have to pay off the genius down the hall for one last semester; release is

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**2 disks may be 1 double sided disk
* Comal Today subscriber price. $104.90 regular price. No manual. Add $15 plus $3 shipping for manual

not scheduled until late fall.

Activision, Inc., 415-960-0410 (see address list, this page).

FREE PLAYNET TIME

The PlayNET bulletin board service's revised rate structure includes four free online hours with payment of the $12 monthly account maintenance fee. The former monthly charge was $8, with no free time. The hourly rate remains $2.75.

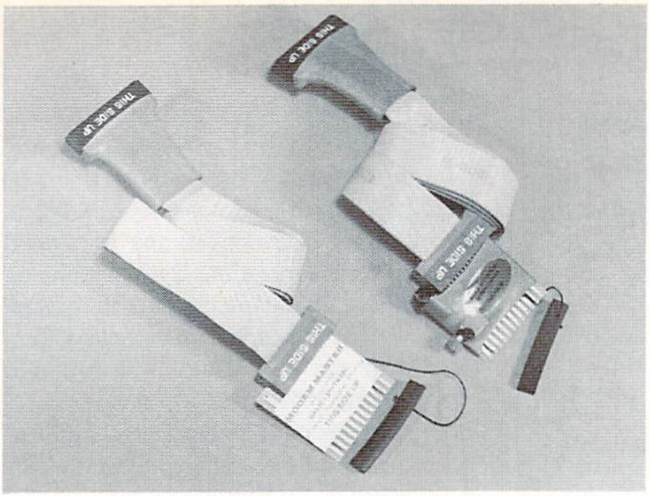
For more information on PlayNET, and how you can obtain a $19.95 membership kit free, see page 6.

PlayNET, 1-800-PLAYNET (see address list, this page).

CABLE NEWS

Four hardware connection items from Master Software:

The *Modem Master* ($29.95) 4' extender cable lets the 64, 128, VIC 20, or Plus/4 user place user port devices in locations other than the rear of the computer, along with permitting the use of devices which otherwise wouldn't fit due to interference of plastic housings. *Modem Master Plus* ($34.95) adds a system reset switch, buffered to prevent electrical damage and including programs to recover the BASIC program in memory at time of lockup.



The Modem Master *four-foot extender for the user port lets Commodore owners place user port devices in places other than the rear of the computer. READER SERVICE NO. 258*

Continued on page 146

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DISK DRIVE FAN FOR COMMODORE



Designed to work with Commodore Disk Drive Models 1540, 1541, SFD 1001, the quiet C-100 fan enclosure moves cool, filtered air through the top vents of the disk drive cooling the drive and thereby reducing the misalignment problems caused by heat build-up. A custom filter keeps room dust from entering the disk loading opening. This greatly increases the life span of the disk drives, and decreases the maintenance required to keep the drive functioning properly. Only $39.95 plus $2.50 for shipping and insurance.

115 vac



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Companies Mentioned in *Scuttlebutt*

Activision, Inc.
2350 Bayshore Parkway
Mountain View, CA 94043
Phone: 415-960-0410

Aegis Development, Inc.
2210 Wilshire Blvd. #277
Santa Monica, CA 90403
Phone: 213-306-0735

Applied Computer Consultants
Pentagon Towers
P.O. Box 36186
Edina, MN 55435
Phone: 612-827-2425

Bear Graphics Software
P.O. Box 12206
New Brighton, MN 55112

Bible Bytes
P.O. Box 1584
Ballwin, MO 63022

CBS Interactive Learning
CBS Inc.
One Fawcett Place
Greenwich, CT 06836
Phone: 203-622-2500

Dynacomp, Inc.
1064 Gravel Road
Webster, NY 14580
Phone: 716-671-6160

Electronic Arts
1820 Gateway Drive
San Mateo, CA 94404
Phone: 415-571-7171

Ellicott Creek Software
30 Chestnut Ridge Lane
Tonawanda, NY 14150

Gamco Industries, Inc.
Box 1911
Big Spring, TX 79720
Phone: 800-351-1404; in TX 915-267-6327

Great Game Products
8804 Chalon Drive
Bethesda, MD 20817
Phone: 301-365-3297

Howard W. Sams & Co.
4300 W. 62nd Street
Indianapolis, IN 46268
Phone: 317-298-5409

Intelligent I/O
P.O. Box 70
Potsdam, NY 13676
Phone: 315-265-6350

JDK Images
2224 East 86 Street, Suite 14
Bloomington, MN 55420
Phone: 612-854-7793

Kaltek Labs
Adjuntas, PR 00601-0971
Phone: 809-829-4220

KIRA Corporation
P.O. Box 3183
Falls Church, VA 22043
Phone: 215-683-5699

KnowledgeWare
2013 N.E. 55th Blvd.
Gainesville, FL 32601
Phone: 904-371-6523

Master Software
6 Hillery Court
Randallstown, MD 21133
Phone: 301-922-2962

MicroComputer Accessories
5405 Jandy Place
P.O. Box 66911
Los Angeles, CA 90066-0911
Phone: 213-301-9400

Networx
203 Harrison Place
Brooklyn, NY 11237
Phone: 718-821-7555

Omnitronix, Inc.
P.O. Box 43
6014 East Mercer Way
Mercer Island, WA 98040
Phone: 206-236-2983

PlayNET
200 Jordan Road
Troy, NY 12180
Phone: 1-800-PLAYNET

Readup Inc.
P.O. Box 95
Port Edwards, WI 54469
Phone: 715-887-2333

Roberts Information Systems
P.O. Box 666
152 W. 4th
Prineville, OR 97754
Phone: 503-447-6275

SubLOGIC Corporation
713 Edgebrook Drive
Champaign, IL 61820
Phone: 217-359-8482; orders 800-637-4983 except IL, AK, HI

Tensoft
P.O. Box 86971
San Diego, CA 92138
Phone: 800-828-1829

The Computer Club
4843A South 28th Street
Arlington, VA 22206
Phone: 703-998-7588

TAB Books Inc.
Blue Ridge Summit, PA 17214
Phone: 717-794-2191

Thoughtform
45828 Emerson Street
Hemet, CA 92344

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NUMBER ONE ARCADE HITS...



Put on your black belt and challenge your friends or the computer through nine picturesque settings in this leading Martial Arts Game to become the **KARATE CHAMP**. For the Commodore 64™/128 and the 48K Apple II® Series.

As the crack shot **COMMANDO**,* battle overwhelming odds to defeat advancing rebel forces. Armed with only a machine gun and hand grenades, you must break through the enemy lines to reach the fortress. For the Commodore 64™/128.

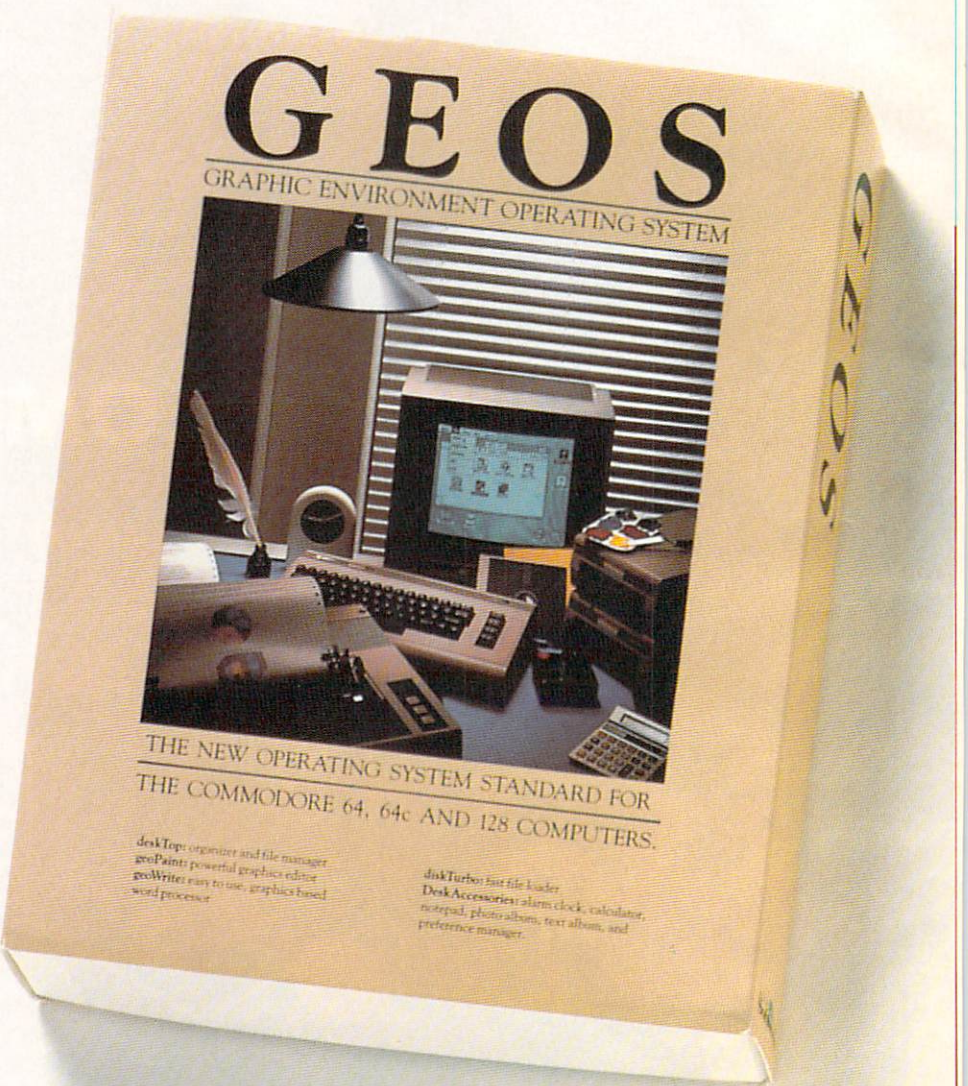
Prepare for the fight of your life . . . you are the **KUNG-FU MASTER**.** Battle the evil forces through the five dangerous floors in the wizard's castle to rescue the captive fair maiden. For the Commodore 64™/128 and the 48K Apple II® Series.

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SCIENTISTS
DISCOVER NE



When we started our company on the west coast, people thought we were a little spaced out. So you can imagine their reactions when we announced we'd discovered a new universe.

People laughed. People scoffed. And they really freaked out when we told them where we'd found it:

Inside a Commodore 64.

It's called GEOS. And it turns any Commodore into a powerful PC that holds its own against any computer, no matter what kind of fruit it was named after.

GEOS: The superior intelligence. Of course, we always knew Commodores possessed superior brains. It just took GEOS to discover them.

You see, GEOS opens your Commodore to a huge universe that can hold an infinite number of applications. Which means that GEOS can do just about anything the expensive PC's can do, including one thing they can't:

Add even more GEOS applications that are being developed even as you read this.

Increase your speed to warp factor 7. The first thing you notice with GEOS is how its diskTurbo speeds up your Commodore's disk loading and storing time.

Not twice or three times as fast. But five to seven times faster than normal. Which lets you streak through files and documents at what seems like warp speed.

And that saves you endless time.

Every universe comes complete with a desk. The way to keep order in our universe is with the GEOS Desktop. It's just like your desk at home, only without the coffee stains.

The Desktop keeps your art and documents filed, and comes

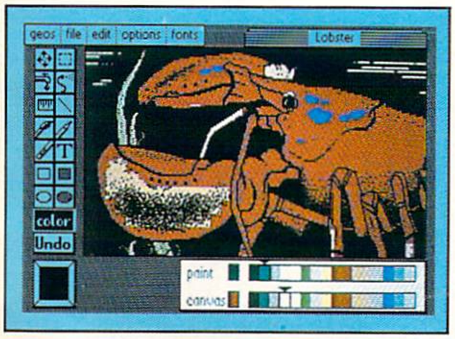
AT BERKELEY
W UNIVERSE.

with all the accessories you need to keep you organized:

An alarm clock keeps you punctual. A notepad keeps your memos. And a calculator keeps your accountant honest.

How to communicate with a new universe. With geoWrite, you can rearrange your written words. Move blocks of copy. Cut and paste. And even display your text in fonts of different styles and sizes, right on the screen.

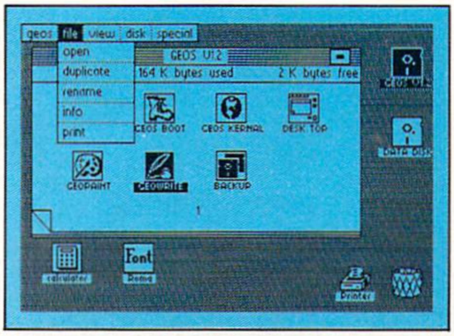
With geoPaint, you become a Michelangelo with a mouse.



Sketching and painting with all kinds of colors, textures and patterns.

You can invert, mirror and rotate images. Insert them into your geoWrite documents. And save them in your GEOS Photo Album for use later.

Finding your way through the universe. The most difficult



thing about a new universe is finding your way around. But with GEOS, you only need to remember two things:

Point and click.

When GEOS offers you options, you just point to your answers and click your mouse or joystick.

You want to draw? Point and click.

You want to write? Point and click.

You want to fill in that obtuse rhomboid with an air-brushed geometric pattern in a lighter shade of pink? Point and click.

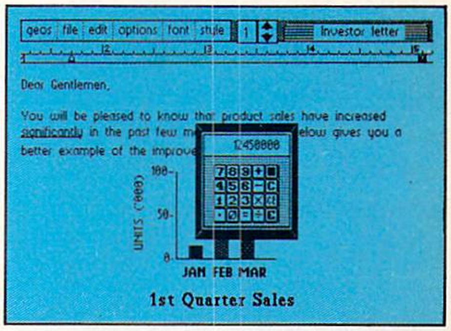
Easy, huh? And in case you ever do make a mistake, GEOS backs you up with an "Undo" feature that undoes the very last command you entered.

Berkeley Softworks

Running out of space. With GEOS, that's hardly likely. Because there's endless space in the universe for new applications.

Unfortunately, there's only so much space in this ad.

So zip down to your nearest software dealer. Tell him you want to explore the new universe in your Commodore.



And if he looks at you like you're some kind of alien, well, just tell him Berkeley Softworks sent you.

The name is universally known.

To order, call 1-800-443-0100 ext. 234

GEOS is just $59.95

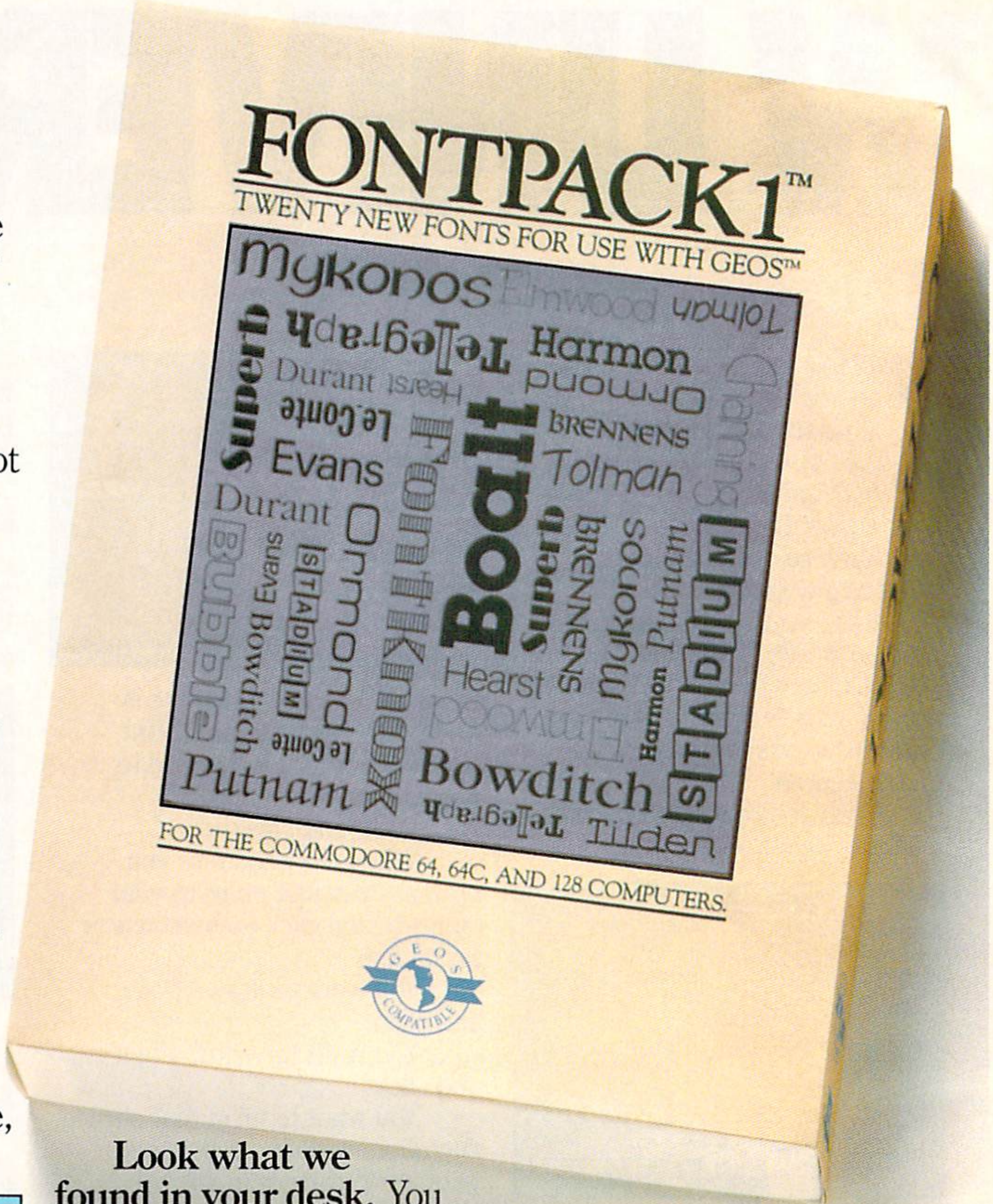
(California residents add 6.5% sales tax.) $2.50 US/$5.50 Foreign for shipping and handling. Allow six weeks for delivery.

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Reader Service No. 216

The brightest minds are working at Berkeley.

THE UNIVERSE



Well, we told you it wouldn't be long until the first GEOS applications were ready. And these are just the first. The number of satellites in the GEOS universe is infinite.

Judge Font Pack on looks alone. Let's face it. People judge your work not only by what it says, but how it looks.

That's why we developed Font Pack. A collection of 20 different type styles that not only say what you mean, but really look like they mean it.

Charming is charming. **Boalt** is all business. FontKnox is financial. And **Telegraph** is … hmmm, well, you get the point.

When you combine these 20 fonts with the five you get with geoWrite, your work not only reads better, it practically speaks for itself.

Boalt	STADIUM
Bubble	Telegraph
Durant	Mykonos
Harmon	**Superb**
Ormond	Tilden
LeConte	Bowditch
Putnam	

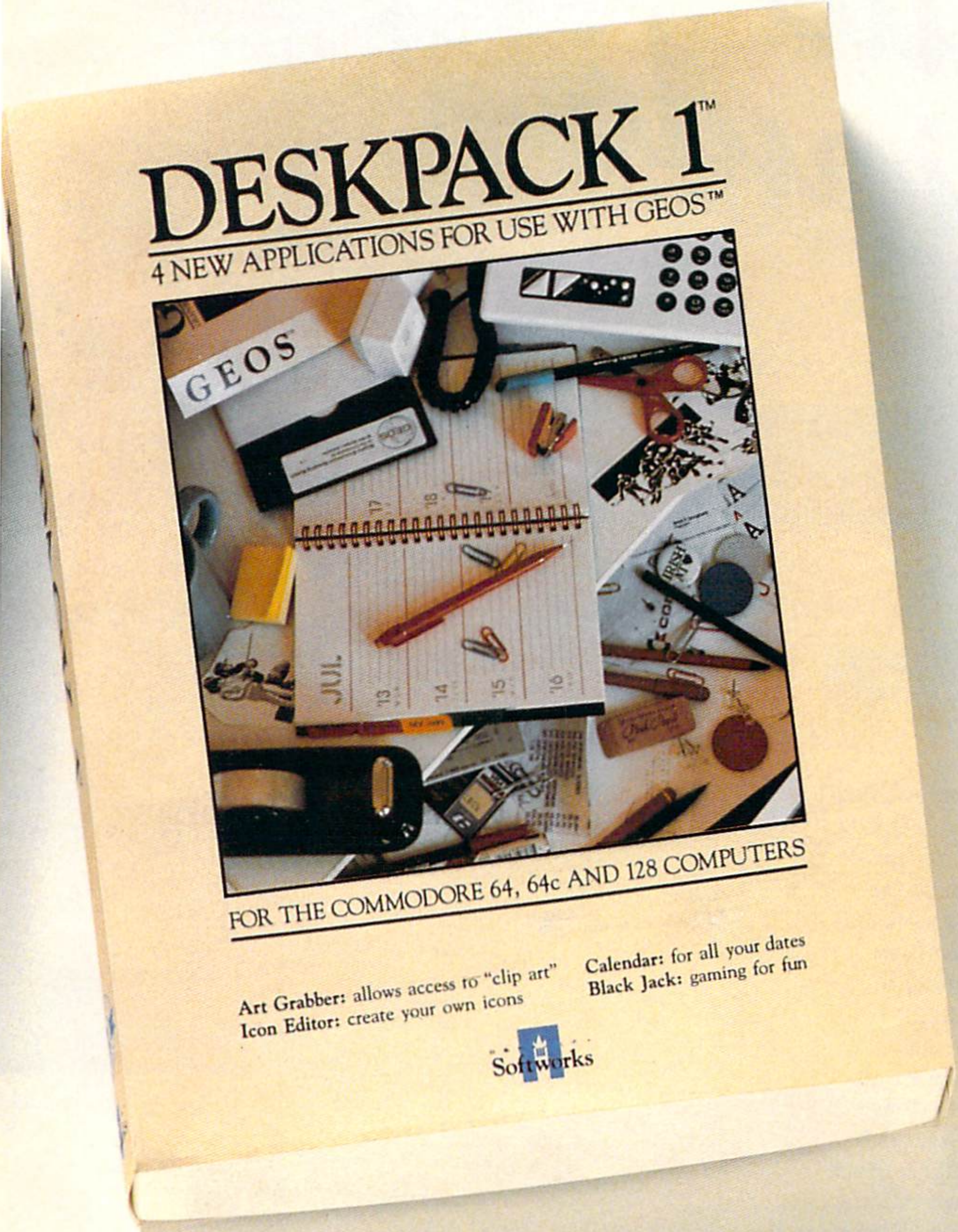
Look what we found in your desk. You know how there's always one drawer in your desk that's filled with really neat stuff? Well, GEOS has one of those, too.

It's called Desk Pack.

The ingenious Desk Pack Graphics Grabber copies graphics from clip art galleries like Print Shop, Print Master and Newsroom for use in geoWrite and geoPaint.

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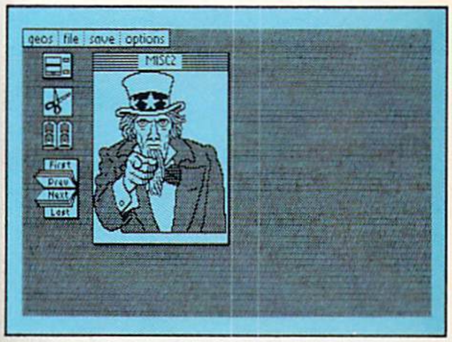


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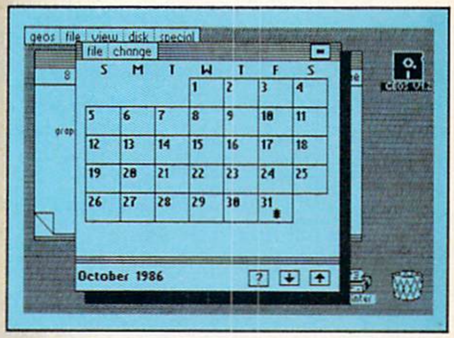
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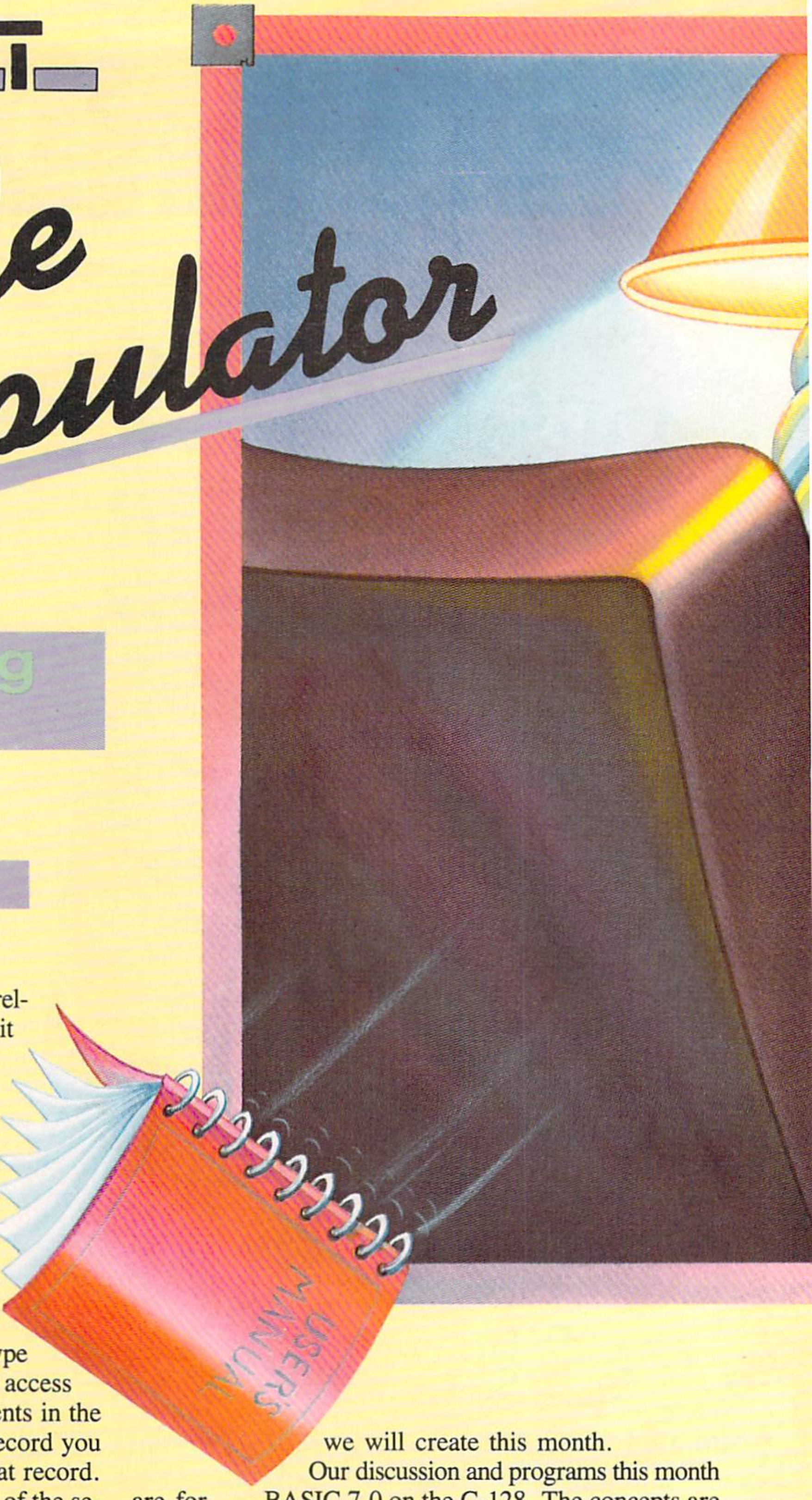
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File Manipulator



Virtues of Using Relative Files

By Dale Rupert

What? You have never used relative files? Rumor is that it takes some sort of programming genius to be able to use them. Perhaps a high IQ is a prerequisite for learning about relative files from the original *VIC-1541 Disk User's Manual,* but as we shall see, creating and manipulating relative files in BASIC 7.0 is quite straightforward, if not downright child's play.

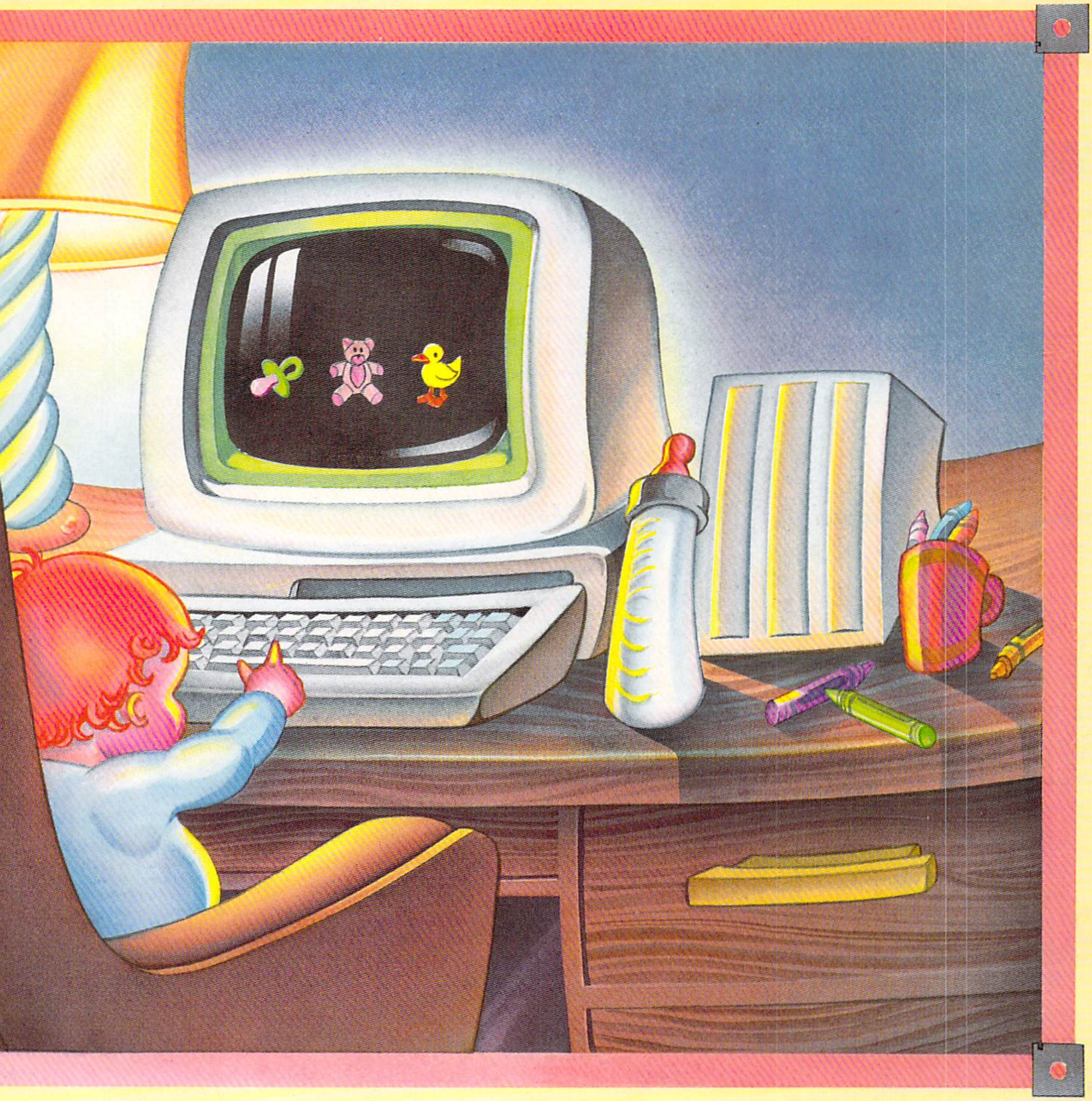
So what are these relative files with their strange accompaniment of "side sectors," "pointers," and "records"? A relative file is a type of disk file which allows easy, random-order access to each of the elements in the file. The elements in the file are called "records." To identify which record you wish to access, you simply set a pointer to that record. The computer automatically finds the location of the selected record on the disk and allows you to read it or write to it. We won't worry about "side sectors" because it is not necessary to know anything about them in order to use relative files.

There is one more concept we must discuss. Each record in the file may be further subdivided into portions called "fields." Locating a specific field within a given record in a named file on a disk is really not a difficult programming task, especially with the model programs we will create this month.

Our discussion and programs this month are for BASIC 7.0 on the C-128. The concepts are identical, however, for BASIC 2.0 on the C-64 and for other versions of BASIC. After studying the examples in this article, you should be able to translate the BASIC 7.0 command sequences into your own computer's language.

RELATIVE DIFFERENCES

Both relative files and sequential files provide structures in which data may be stored and accessed. Relative files are called random access files in other computer



JOSIE YEE

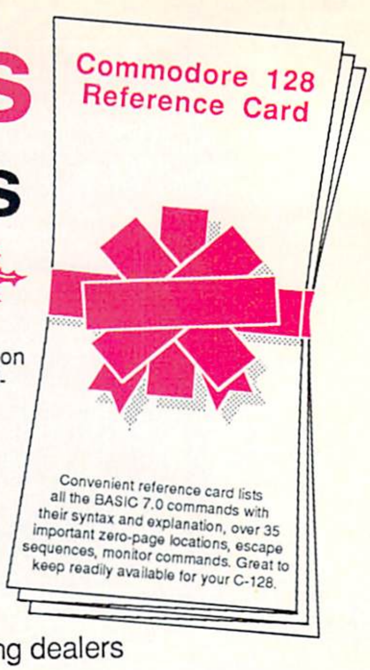
language dialects. The term "relative" obscures their primary distinguishing characteristic: that each record is individually and independently accessible. "Random access" is a more descriptive term than "relative" for these files, although we are not dealing with true random files as defined by Commodore. (See the March 1984 issue of *Ahoy!* for a discussion of random files.)

Sequential files also consist of records. Before reading the 30th record in a sequential file, the computer program must first read through the preceding 29 records in the file. This is the main disadvantage of sequential files. If records must be accessed in random order, typically the program first reads them from the disk into arrays in memory. Once in memory, each record is located by an index of the array.

Each record in a relative file also has an index associated with it. The index is stored right on the disk with the file as it is created. (The storage areas for these indexes are the side sectors mentioned earlier. The computer takes care of all this for us.)

If each relative file carries along its own indexes, and if each record is easily accessed in random order, then why are sequential files even used? The disadvantage of relative files is that they generally require more disk

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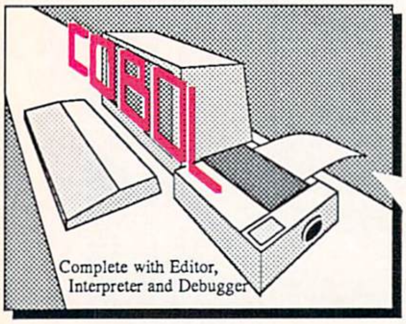


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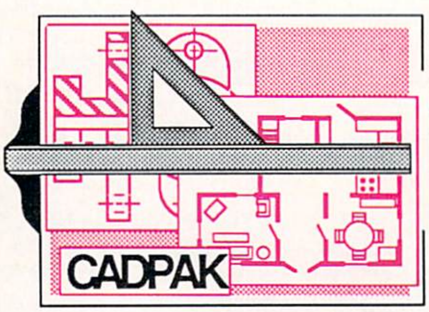
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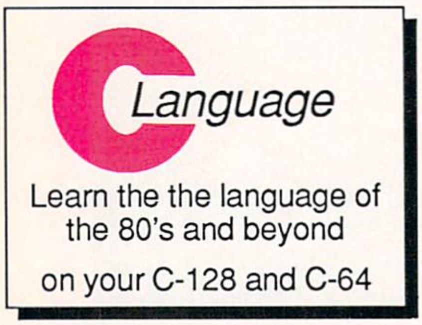
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space. Two reasons for the storage inefficiency are that the indexes are stored along with the data, and that the fixed-length record structure usually produces wasted space. That brings us to the topic of record length.

The lengths of the records within a sequential file may vary. The records are separated from one another by a termination character called a delimiter. For example, if the three records in a file contain the names Mercury, Venus, Mars, the sequential file might look like this:

```
Sequential File
          MERCURY^VENUS^MARS^
Record # 1-------2-----3----
```

The first record is 8 characters long including the delimiter, signified here by the caret. The second and third records are 6 and 5 characters long, respectively.

Contrast this sequential file with a comparable relative file. All records in the relative file must be the same length. There are two ways to accomplish this with the data in the example above. Either the longer data values must be truncated or cut off to the length of the shortest record, or the shorter records must be "padded" or filled with blanks to be as long as the longest record. Padding is usually more desirable than losing data.

Before we create a relative file then, we must determine what the longest possible record will be and use that as the record length. Now the storage inefficiency should be clear. If we choose a record length of 8, our relative file looks like this:

```
Relative File
          MERCURY^VENUS00^MARS000^
Record # 1-------2-------3-------
```

The 0's represent null characters used as padding by the computer. The carets again represent a terminating character or delimiter, such as a carriage return CHR$(13).

Perhaps it is more obvious now how the computer can randomly locate these relative file records. Since the record length is fixed at 8, record number 2 always starts with the 9th character in the file. Record number 3 begins with the 17th character. The 101st record begins with the 801st character. In general, the Nth record will be found starting with character number RL * (N−1) + 1 in a file where the record length is fixed at the value of RL.

Where would the 101st record of a sequential file be found? Without knowing the lengths of each record, it would not be possible to predict where the 101st record begins. The computer finds the 101st record only by reading and counting the first 100 records.

WRITING RELATIVE RECORDS

It is not difficult to create the relative file described above. This program does it:

```
10 DOPEN#1,"EXAMPLE",L8
20 FOR N=1 TO 3
30 READ R$
40 RECORD#1,N,1
50 PRINT#1,R$
60 NEXT N
70 PRINT DS$ : DCLOSE
80 DATA MERCURY, VENUS, MARS
```

Line 10 opens a channel with a logical file number 1. The filename is "EXAMPLE" and the record length (L) is given as 8. Line 30 reads the data from line 80. Line 40 tells the computer which record is to be written. The #1 is the logical file number specified in line 10. The value of N goes from 1 to 3 as the three records are written. The 1 at the end of line 40 is optional. It tells the computer to point to the first byte of the Nth record. We will always use a value of 1 here.

Line 50 writes the data to the selected record. Once all three records have been written, line 70 closes the file. Actually the three records are first written to a buffer in memory. The DCLOSE statement causes the buffer to be physically written to the disk.

If a program error prevents the DCLOSE from being executed, the data remaining in the buffer could be lost. (Always type DCLOSE in direct mode if the "active" light on the disk drive is still on when the program stops. If the light is flashing, type PRINT DS$: DCLOSE to clear the fault and close the file.)

Notice another difference from the way sequential files are opened. Once a relative file is open, it may be written to or read from. The DOPEN statement does not specify which type of operation will be performed on the file. The relative file is available for random-access reading, or writing, or both.

READING A RELATIVE FILE

After you have entered and run the program above, there is a new file on the disk called "EXAMPLE." To read the data in this file, add the following lines and type RUN 100:

```
100 DOPEN#1,"EXAMPLE"
110 FOR N=1 TO 3
120 RECORD#1,N,1
130 INPUT#1,RD$
140 PRINT RD$
150 NEXT N
160 PRINT DS$ : DCLOSE
```

Notice that once the file has been created, there is no need to specify the record length in the next DOPEN statement. The ",L" is needed only when the file is first written. We use the INPUT# statement to read each record just as with sequential files. This statement reads characters up to the first carriage return in the record.

This is about all there is to writing and reading relative file records. The sequence is simply:

1. Open the file (DOPEN)
2. Point to the desired record(s) (RECORD)
3. Read or write the record(s) (INPUT#, PRINT#)
4. Close the file (DCLOSE)

ERROR HANDLING

There are various conditions that cause errors when using relative files. The BASIC 7.0 variable DS$ contains the error codes and descriptions for disk errors. If the disk drive light is flashing and the program has ended, you should type PRINT DS$ in direct mode to display the error and to turn off the light. You may also have to type DCLOSE if the light stops flashing but remains lit.

In general when a program writes to a relative file for the first time, an error 50 "Record Not Present" occurs. This error occurs when the pointer is set with the RECORD statement to a record which has not yet been written. (In our sample program above, this error did not occur since the total length of the three records was less than 256 characters.)

The best way to handle the error 50 problem is to write the highest numbered record when the file is first opened and then read DS$ to clear the error. Assume we knew that we would never have more than 40 records in the file. We could open it and write to the 40th record this way:

```
1 DOPEN,"TEST",L10
2 RECORD#1,40,1
3 PRINT#1,"DUMMY"
4 PRINT DS$
5 DCLOSE
```

Now the space on the disk has been allocated for 40 records, the 40th record has dummy data in it, and the error 50 has been cleared by line 4. If we later need to put more than 40 records in this file, we may simply open the file again, put the RECORD pointer to the new maximum number, and write the additional records. We must read DS$ each time a record is accessed which has a higher record number than any previously accessed. That is an advantage of writing the highest numbered record first.

Another suggestion. Put your RECORD# statement immediately before the corresponding PRINT# or INPUT# statement. A bug in BASIC gives improper values of DS$ if a GETKEY statement is between the RECORD# and PRINT# statements, for example.

Whenever a program opens a file, it should read DS$ and act accordingly. VAL(DS$) gives the error number of the most recent disk input or output. A value of 0 means that the file access was without error.

An error will occur if we try to write data which contains more characters than the record length specified for the file. For that reason, the program should carefully check the length of each string of data before it is written to the file. We will see how to do that in the relative file model to be discussed.

INTO THE FIELDS

Relative files are more flexible if their records are subdivided into smaller segments called fields. Suppose we want to store the names of the planets and their numbers of moons in a relative file. Each record should contain two fields: a name field and a number field. The records for Earth and Mars would look like this:

```
 Field 1 ---v       v---Field 2
Record #1:  EARTH   1
Record #2:  MARS    2
```

We could create variable length fields or fixed length fields. For example, Field 1 (the name field) of Record #1 must be at least five characters wide, whereas Field 1 of Record #2 would need to be only four characters wide. The sample program on page 123 uses fixed length fields. We will simply pad the data in each field with spaces as necessary.

For example, let Field 1 have a length of 14. That is longer than the longest name we have to store. Let Field 2 have a length of 10. That is certainly wider than necessary. Ten characters will allow us to store most floating point numbers easily.

Once we have defined the field lengths, we can calculate the record length. The lengths of the fields add up to 24. We must add one for the delimiter at the end of each record. That gives a record length of 25.

Field 1 starts at character 1 and is 14 characters wide. Therefore Field 2 starts at character 15 and is 10 characters wide. The delimiter fills the 25th character position in each record. The record for Mars and its number of moons looks like this:

```
Character #          1111111111222222
            1234567890123456789012345

            MARS----------2---------^
```

The number, structure, and control of the fields is up to us. The RECORD statement does allow us to move the pointer to a specific character within a record so that only a part of a record may be read or written. But we will not use that method of selecting fields. Instead, we will always read the entire record into a string variable. We will read or write the desired substrings, then we will write the modified record string in its entirety back to disk.

READY TO MANIPULATE

Now that we have covered the background of relative file handling, we are ready to put our knowledge into practice. Refer to the program *Planetary Moons Database* on page 123. This program creates a relative file called PLANETS. The file has a record length of 25 as defined in line 50. SP$ is a string of 24 spaces to

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be used for padding. Line 70 reads a planet's name and its number of moons into P$ and M$ respectively. WR$ is initialized to be a string of 24 spaces in line 80. P$ is placed into WR$ beginning at character position 1 in line 90. M$ is placed into WR$ beginning at character position 15 in line 100. WR$ still has a length of 24 characters, but some of its space characters have been replaced by data characters within the two fields.

NR keeps track of the current record number. Line 110 points to the next record, and line 120 puts the data into that record on the disk. This is repeated for the other eight pairs of data. Line 130 displays the disk error status and the data just written. If more than ten 25-character records were written, an error 50 "Record Not Present" would occur, but as we discussed above, this is not really a problem.

The main program *File Manipulator* on page 123 is meant to be used as a model for creating your own relative file programs. The program can be easily modified and expanded to handle records of any size containing fields of any size and number. It is written to access the PLANETS file created earlier. Line 50 arbitrarily sets the maximum number of records to 60. The lengths of the fields are given in line 70. Pointers to the starting character position for each field are defined in line 90.

Lines 130 through 170 open the file with the filename given to F$ in line 40. The 60th record is written if it does not already exist. This initialization simply guarantees that the specified file exists.

The main loop asks whether the file is to be read or written, or if the user wants to exit the program. The two major parts of the program are the Read routine and the Write routine. Each routine opens and closes the file, although that could have been done once in the main loop instead, as discussed earlier.

The Read routine in lines 250 through 380 asks for the number of the record to be read. The subroutine in lines 320 through 380 reads and displays the selected record and shows it subdivided into its fields. The string function

```
MID$(RD$,PT(F),FLD(F))
```

picks out the Fth field of the chosen record. Recall that the field starts at position PT(F) and it has a length of FLD(F).

The Write routine is in lines 390 through 600. It asks the user for the desired record to be written or modified. Line 450 calls the read and display subroutine so the user can see how the record currently appears. The user specifies which field is to be rewritten in line 460. Enter 0 to leave the record unchanged. A template is shown so the user can see how wide the selected field is. The new data for the field is stored in U$ in line 500.

In case the user enters fewer characters than the width of the field, line 510 pads the entry with spaces. Line 520 truncates the result to the proper field width. In line 540 WR$ is given the current record data as read by line 340. WR$ is padded with spaces in line 550. The new field data in U$ is put into WR$ in line 560, and line 570 truncates WR$ to the proper record width. Line 580 sets the pointer, and line 590 writes the new data to the file.

The number of moons for each planet is correct at the time of this writing (August 1986). If more moons are discovered, as they probably will be (Uranus is a likely candidate), you now have the tools to get into the database and update it. In future columns we will see more advanced ways to access and sort the data in relative files. In the meantime, you should see if you can expand this program to handle three or more fields in each record.

A little time with this program should convince you that relative files are not as difficult as they are said to be. Relative files will become a very useful and powerful part of your programming repertoire. ☐

SEE PROGRAM LISTINGS ON PAGE 123

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THE SHADOW KNOWS: PART II

Exposed! What Commodore Never Told You About Programming Sprites in C-128 Assembly Language

By Mark Andrews

It's difficult to find a real piece of news for a column about assembly language programming. But last month's edition of *Commodore Roots* was a real scoop in the small world of assembly language journalism. It revealed that Commodore had omitted some important information about sprite programming from its official 744-page *C-128 Programmer's Reference Guide,* published by Bantam earlier this year.

In this column, I'll provide all of the vital material on sprite programming that you won't find in your *C-128 Reference Guide*—or in any other publication that I have discovered to date. Then we'll use the missing information in a type-and-run assembly language program that will create and animate a sprite on the Commodore 128 screen.

As noted last month, the data that was left out of the *C-128 Reference Guide* is so important that it is impossible to write an assembly language sprite program without it. If you follow the sprite-programming instructions presented in the reference guide—commissioned by Commodore and published by Bantam—your program won't work. Here's why:

On page 285 of the manual, there is a table of sprite position registers—registers in which values must be placed to position sprites on the screen. Two pages later, there is a segment of assembly language code showing exactly how a value can be placed in one of these registers in a program.

In a sprite program written for the Commodore 64, this example would work just fine. In the C-128, however, the sprite position registers listed on Page 287 are not directly accessible from user-written programs. That's because the C-128's sprite position registers must be accessed via a second set of registers, called *shadow registers,* that are situated in a completely different segment of memory.

Here is how these secret registers work: 60 times each second, during a period known as a vertical blank interrupt cycle, the contents of the C-128's sprite position registers are erased and replaced by the contents of a corresponding block of shadow registers. This operation takes place so often—and so rapidly—that you could sit and stuff values into the C-128's sprite position registers all day long, and you would never get a sprite to show up on the C-128's screen.

In preparing this two-part column, I spent days trying to write an assembly language sprite program for the C-128 in accordance with the instructions provided in Commodore's *C-128 Programmer's Reference Guide.* Eventually, from some vague hints presented in passing in other books, I discovered what was missing from the instructions given in the manual. Next, with the help of some reverse engineering and more than a little luck, I figured out everything I needed to know to write a sprite program for the C-128. Then, finally, I managed to write an assembly language program that would create and animate a sprite on the C-128 screen. This program, titled SPRITE2, appears on page 120.

WHAT SPRITES ARE

Before we see how the program works, it might help to present some fundamental facts about Commodore sprites. (Much of what follows will bear a striking similarity to the explanation of C-64 sprite programming in the April '86 *Ahoy!*—only the values have been changed.)

As you recall from last month, sprites are graphics characters that can be created, colored, and animated quite easily, and can be moved around completely independently of anything else on a computer screen. Using ordinary programming techniques, up to eight sprites can be displayed on a screen simultaneously. These eight sprites are usually numbered 0 through 7.

Sprites are made of tiny dots, just like programmable text characters are; and, like programmable characters, they can be created using standard bit-mapping techniques. But sprites can be several times larger than text characters; up to 24 horizontal screen dots wide and up to 21 vertical screen dots high.

A sprite can be displayed in any of the 16 colors available to the C-128's VIC-II video chip. And sprites can be expanded to twice their normal width and twice their normal height, or four times their standard size. The sprite used in the program that goes with this column will be an expanded one.

BIT-MAPPING A SPRITE

Since a sprite can measure up to 24 screen dots (or bits) wide, and up to 21 screen dots (or bytes) high, a sprite can occupy a total of 504 screen dots. A sprite bit map is illustrated in Figure 1 on the following page.

A sprite can also be pictured as a byte map—a matrix that measures three bytes wide by 21 bytes high, for a

total of 63 bytes. Actually, the bytes that make up a sprite are stored in consecutive order in RAM, starting with the byte in the upper left hand corner of the sprite's bit map and ending with the 63rd byte, the one in the lower right hand corner. But when a sprite appears on the screen, it looks more like the byte map shown in Figure 2.

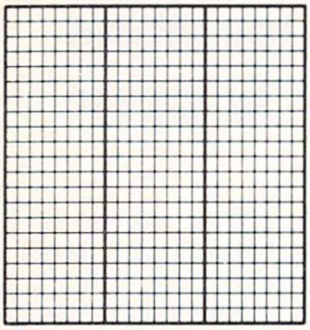


Figure 1: Sprite Bit Map

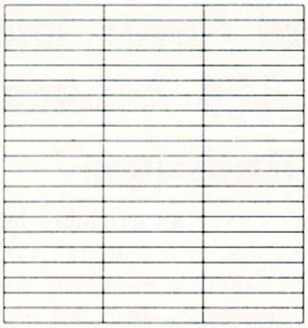


Figure 2: Sprite Byte Map

HOW SPRITES ARE PROGRAMMED

Although it takes only 63 bytes to form a sprite, each sprite consumes 64 bytes in RAM. The 64th byte of each sprite map marks the end of its location in memory.

Sprites can be placed anywhere in free RAM, and a special pointer is provided to mark the location for each sprite. Each sprite pointer is one byte long, so it takes eight bytes of RAM to hold the eight pointers needed to address the C-128's eight sprites. These eight pointers are always the last eight bytes of whatever block of RAM has been designated as screen memory. When the location of screen memory is moved, the addresses of the C-128's eight sprite pointers also change. But it's easy to find them, since they always take up the last eight bytes of whatever block of RAM is being used as screen memory.

A one-byte value is all that's ever needed to define the starting address of a sprite map, since sprites always fall into whatever 16K bank of memory is currently accessible to the VIC-II chip. That means that a sprite pointer is actually an offset that must be added to the starting address of the video bank currently in use to determine the starting address of the bit map that is to be used to form the sprite.

When the Commodore 128 is first turned on, its VIC-II chip is set to retrieve graphics information from Video Bank 0, in RAM Block 0, and to get its screen map from memory registers $0400 through $07FF (1024 through 2047 in decimal notation). At power-up time, therefore, the default address of the first sprite pointer, or Sprite Pointer 0, is $07F8 (or 2040 in decimal notation). And the next seven bytes in RAM are the pointers for Sprites 1 through 7. So the default addresses of the pointers for the C-64's eight sprite pointers are memory addresses $07F8 through $07FF–the last eight bytes in the block of RAM designated as screen memory.

To find the data that it needs to display a sprite, then, all the Commodore 128 has to do is look at the 8-bit value stored in the appropriate sprite pointer. When that value is added to the address of the graphics bank currently in use, the result will be the address of the bit map that must be used to define the sprite.

TURNING SPRITES ON AND OFF

Before a sprite can be displayed, it must be turned on. Sprites are turned on and off with a sprite enable register (abbreviated SPENA) situated at memory address $D015 in Memory Bank 15. Each bit of the SPENA register is associated with one sprite; Bit 0 is used to turn sprite 0 on and off, Bit 1 is used to control sprite 1, and so on. If the bit associated with a sprite is set, the sprite is enabled. If the bit is not set, the sprite is not enabled and cannot be used.

POSITIONING SPRITES

Each of the C-128's eight sprites has two position registers: an X position register used to determine its horizontal placement on the screen, and a Y position register used to determine its vertical position. These registers are abbreviated SP0X through SP7X and SP0Y through SP7Y. In addition, there is a special "most significant X position register" (abbreviated MSIGX) that is used to designate the horizontal positions of all eight sprites. This register is needed because a sprite can be placed in 512 possible horizontal screen positions–too many positions for an eight-bit register to keep track of. If a sprite is to be placed in a position that can be stored as a value in an 8-bit register–a position with a value of less than 255–then the MSIGX register is not used. But if the horizontal position of a sprite has a value of more than 255, a bit in the MSIGX register is set. Each bit of the MSIGX register equates to the number of a sprite; bit 0 is used for sprite 0, bit 1 for sprite 1, and so on.

There is no vertical MSIGY register, because there is no need for one. A sprite can be placed in only 256 vertical positions, so only one 8-bit register per sprite is needed to handle the vertical positioning of sprites on the C-128's screen.

THE C-128'S 'SHADOW' REGISTERS

In the 128, the memory registers used to determine the screen positions of sprites are situated at addresses $D000 through $D010 in memory bank 15–the same addresses they occupy in the C-64's memory. And when the proper values are stored in a horizontal or vertical position sprite register, the C-128–just like the C-64–uses those values to determine position of the upper left hand corner of the sprite. There is an important difference, though, between the way the sprite position registers are used in the Commodore 64 and the Commodore 128. The difference is, of course, those mysterious shadow registers. Every 1/60 of a second, during the C-128's vertical blank interrupt, the contents of the sprite position registers are erased and are replaced by the contents of a block of shadow registers at memory addresses $11D6 through $11E6. So, when you use sprites in a C-128 program, you must set their positions on the screen using memory addresses $11D6 through $11E6 rather than using memory registers $D000 through $D00F.

MOVING SPRITES OFF THE SCREEN

Another important fact about sprite positions is that storing a value in a horizontal or vertical position register does not ensure that a sprite will be displayed on the screen. Of the 512 possible horizontal positions of a sprite, only positions 24 through 343 are visible on the screen. Of the 255 vertical positions that are available, only positions 50 through 249 are actually visible. It's therefore quite easy to make a sprite disappear; all you have to do is store the value of an offscreen position in its horizontal or vertical position register.

Figure 3 shows the shadow position registers that must be used to position each of the C-128's sprites horizontally and vertically on the screen.

FIGURE 3
Sprite Position Registers

HEX ADDRESS	POSITION REGISTER	HEX ADDRESS	POSITION REGISTER
$11D6	SP0X	$11DE	SP4X
$11D7	SP0Y	$11DF	SP4Y
$11D8	SP1X	$11E0	SP5X
$11D9	SP1Y	$11E1	SP5Y
$11DA	SP2X	$11E2	SP6X
$11DB	SP2Y	$11E3	SP6Y
$11DC	SP3X	$11E4	SP7X
$11DD	SP3Y	$11E5	SP7Y

$11E6– – –MSIGX (Most Significant X Position Register)

SELECTING COLORS FOR SPRITES

In addition to the 2 bytes plus one bit that determine the position of each sprite, each of the C-128's eight sprites also has one color register. The color register for sprite 0 is at memory address $D027 in Memory Bank 15, and the addresses of the color registers for the other seven sprites follow in consecutive order. The color address for sprite 7 is therefore at memory address $D02E in memory bank 15.

To select the color of a sprite, all you have to do is store the standard value of one of the Commodore 128's 16 colors in that sprite's color register. Every bit that is set on the sprite's bit map will then be displayed in the selected color. Every dot that has a value of 0 will be transparent, and will not cover up anything that is beneath it on the screen.

EXPANDING SPRITES

As mentioned, a sprite normally measures 24 horizontal screen dots wide by 21 vertical screen dots high. But by using two special registers called XXPAND and YXPAND, a sprite can be expanded to twice its normal width, twice its normal height, or both. The XXPAND register is at memory address $D01D in memory bank 15, and the YXPAND register is at $D017 in memory bank 15. Each bit in each register corresponds to a sprite number, with bit 0 controlling the size of sprite 0, bit 1 controlling the size of sprite 1, and so on.

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ON WITH THE PROGRAM

Now we're ready to take a look at the SPRITE2 program. Actually, it's an improved version of the program that appeared in last month's column: a high-resolution program that printed a message in quadruple-size characters on the C-128 screen. This month, the program is expanded into one that also includes an animated sprite routine.

In its newest form, the program copies a character set from ROM into RAM and then prints a message on the screen in large type. It then clears a bit map for sprite 0, copies some data into the bit map from the character set in RAM, and places an expanded sprite in an area out of viewing range at the top of the screen. Next, the sprite descends into viewing range, and maintains a slow descent until it reaches a predetermined position. Then it stops and becomes a part of the message displayed on the screen.

THE 'INDFET' ROUTINE

One noteworthy feature of the program is its use of a C-128 Kernal routine called INDFET, which has a call address of $FF74. With the help of the INDFET routine, a program can load the accumulator with any value from any of the C-128's 16 memory banks, without leaving the memory bank that is currently active.

The INDFET routine works much like indirect indexed addressing—a form of addressing in which the Y register and a two-byte zero-page pointer are used in the following format:

```
LDA (POINTER),Y
```

Before indirect indexed addressing is used in a program, a base address must be placed in a two-byte zero page pointer, and an index value must be placed in the Y register. Then, when a statement that uses indirect indexed addressing is encountered, the value stored in the Y register will be added to the eight-bit address pointed to by the pointer, and the accumulator will be loaded with the contents of the resulting address.

To use INDFET, this is what you have to do: Store a base address in a zero-page pointer, load the accumulator with the address of the pointer, load the X register with the desired bank number, and load the Y register with an index. Then you can load the accumulator with any value you wish by simply doing a JSR to memory address $FF74. When the routine ends, the value that has been fetched will be in the accumulator, and the C-128 will still be in the memory bank that it started out in.

Now you know how to set up a high-resolution program on the Commodore 128, and how to program the C-128's sprites. □

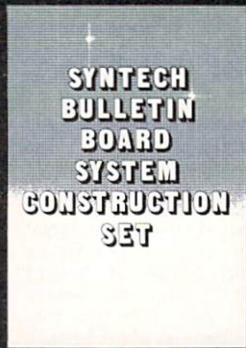
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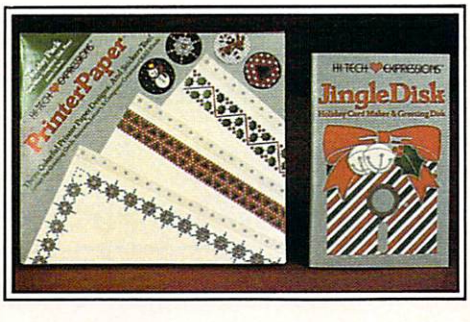
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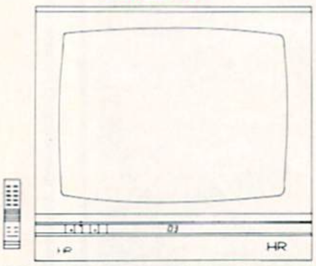
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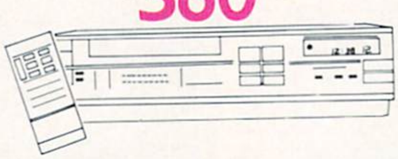
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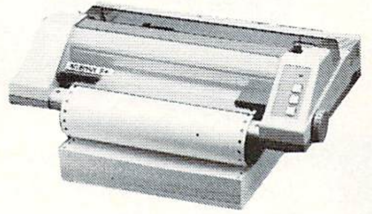
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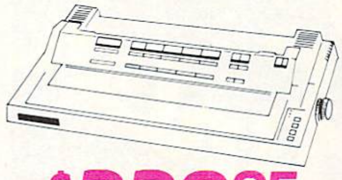
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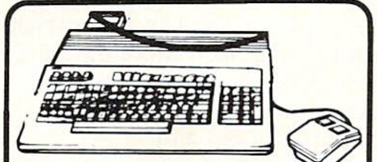
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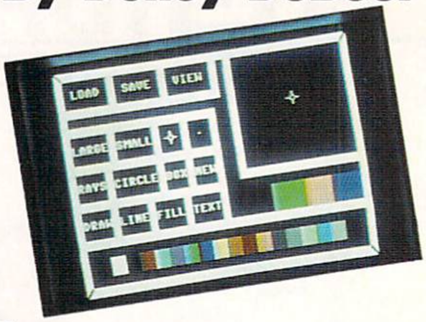
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THE ARTIST

For the C-128

By Denoy DeBoer



The Artist is a multicolor sketching program which, though written almost entirely in BASIC, supports many of the features found in commercial drawing programs. Because it is mostly BASIC, it is very easy to expand, as I'll explain below. But first let's look at some of the features *The Artist* supports:

DRAW–used to draw as you would with a pen. When you first enter this mode, the pen will be up. You can move the cursor anywhere on the screen without leaving a trail. Hit the fire button to put the pen down. A bell will sound to indicate that the pen is now down. Now, wherever you move the cursor, it will leave a trail in the current drawing color. To lift the pen back up, hit the fire button again.

LINE–simplifies the task of drawing a straight line between two points. To draw a line, place the cursor where you want the first endpoint to be. Hit the fire button and the computer will set a point at that spot and sound a bell. Now, move the cursor to the spot you want and other endpoint to be. Hit the fire button again, and...voilà, you have a line. To make connected lines, hit the fire button again (this will set another point where you just finished drawing the line). Move the cursor to where you want the other endpoint to be, hit the fire button once more, and there you have it–a connected line. You can continue this process for as long as you wish.

BOX–works somewhat like the LINE command, except now you select two opposite corners instead of endpoints.

CIRCLE–allows you to draw either circles or ellipses. First, move the cursor to where you want the center of the circle to be. Hit the fire button. You will then have to select the radius of the circle. The cursor will now only move either up or down. Once you have the desired length of the radius, hit the fire button. If you want a "perfect" circle, hit the fire button again. The computer will then draw the circle. If, however, you want an ellipse, after selecting the vertical radius, move the cursor left or right to select the horizontal radius.

RAYS–allows you to draw rays from a central point. First, select a point. Now, move the joystick and hold the fire button down at the same time. Rays will shoot out from the central point to the current cursor position. To draw a new ray, hold down the fire button without moving the joystick. The bell will sound indicating that rays will now be drawn from that central point. The most beautiful rays are drawn with a cursor speed of 1.

FILL–should be used with care. Move the cursor to the area to be filled and hit the fire button to activate the fill. First, the outline of the area to be filled must be completely connected. If there is a gap anywhere, the "paint" will spill out

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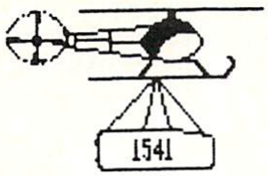
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all over the screen and ruin your masterpiece. Second, the palette used for the FILL operation *must* be the same one used to draw the outline of the shape to be filled. Before performing any FILL operations where there is even a remote chance that you save the current screen to the safety buffer by hitting the "S" key. That way, if you mess up, you can hit "R" to recover your screen.

Note that in any of the drawing modes, you can hit the "S" key to save the current screen to the buffer, or "R" to restore the screen from the buffer. Please note that it takes approximately 10 seconds for the program to save or restore a picture from the buffer. To go back to the MENU screen, press any other key.

MENU SELECTION

When you first run the program, you will be greeted with a menu screen. The upper 4/5 of the screen is the Main Menu; the lower portion is the Color Menu. Most of the commands are self explanatory, or have been explained above. To make a choice, use the joystick (plugged into Port 2) to move the cursor to the box of the selection you want to make and hit the fire button. In addition to the commands already covered, there are a few more available from the Main Menu.

On the left hand side, near the center of the screen, you will find two boxes marked LARGE and SMALL. These boxes allow you to select the size of your pen strokes. When you are in LARGE mode, the cursor will be twice its normal size. In addition to the two brush (pen) sizes available, you will be able to select from two types of cursors. The small cursor is good for precision work. The crosshair cursor is good for lining up corners and making sure that points are connected. The speed of the cursor can also be adjusted by hitting the numbered keys from 1-9. 1 is the slowest speed and 9 is the fastest. I recommend a speed of 1 for detailed work. The program also allows for placing text on the graphics screen. Use the TEXT option to do this. Please note that the RVS (reverse video) option will not work when you use palette number 3 as your painting color.

In the upper left hand corner of the Main Menu screen, you'll also find commands to LOAD, SAVE, or VIEW your work. When saving your picture, keep the name under 13 letters long. The program will automatically add the suffixes ".COL" and ".PIC" to your name.

COLOR SELECTION

Color selection is easier to do than it is to explain. In the lower right hand corner of the Main Menu, you'll find colored boxes. These are the four palettes available for you to work with. The leftmost is palette number 1. It controls the background (canvas) color for the whole screen. The next three palettes are numbers 2, 3, and 4 respectively. These are your painting palettes. However, keep in mind that you can also paint with palette number 1. This is useful for erasing mistakes.

Just below the palette is the Color Menu. To select a color you would like to use, move the cursor to that color and press the fire button. Now move the cursor back up to one of the four palettes and press the fire button again. The palette you selected will now change to the color that you have selected. Now anything you draw with that palette will be in the current color of that palette.

Although you can use all 16 colors on the screen at the same time, there is a restriction as to how the colors may be used. You can change the colors in any of the palettes as many times as you wish, but keep in mind that if you want two or more different colors right next to each other, they each must be drawn with a different palette. I suggest that you try out each of the commands and get a feel for what they do before trying to do any serious work.

SUGGESTIONS

You should keep in mind that *The Artist* is not a precision drawing program. Just like any other drawing tool, it may take some time to get used to. During your drawing process, you're sure to get messy (connected lines extending through each other, etc.). This is okay because you can always go back and touch up with the DRAW command. As a matter of fact, this is how you should work. Another bit of advice is to work from the background forward. In other words, draw (or paint) the sky and then add the mountains and streams later.

You'll also notice that the text looks a little strange on the multicolor screen. You can use the DRAW command to touch up the letters.

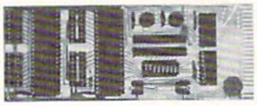
Last but not least, if the program should crash for any reason, just hit RUN STOP and RESTORE at the same time. You can then re-RUN the program and the picture you were working with will still be there. However, keep in mind that the safety buffer is now wiped out.

TYPING IT IN

To create a copy of *The Artist,* type in the BOOTER program on page 124 and save it as the first program on your

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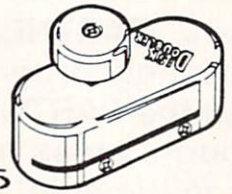
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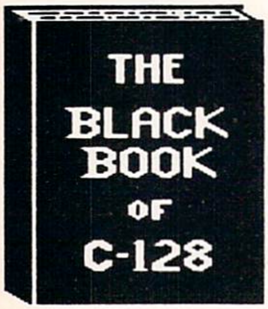
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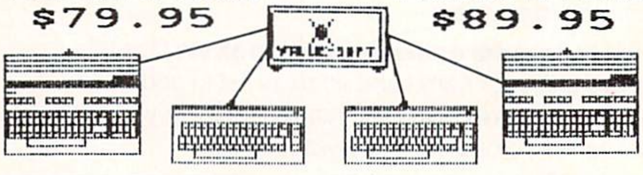
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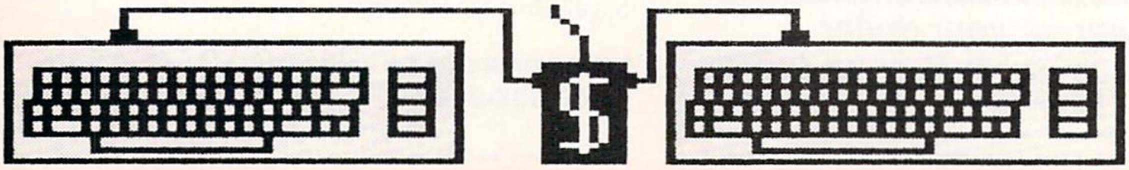


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disk. Now enter the C-128's built in monitor by hitting the f8 key. Type M 0E00 0EB8 and press RETURN. The screen will fill with hexadecimal numbers. Move the cursor up to the lines and change the hexadecimal values to match those in the listing of the second program (SPRITE DATA). Be sure to press the RETURN key at each line after you have made the changes. Once you have finished changing the values to match those in the listing, move the cursor to a blank line and type M 00B00 00B10. Change the values in these locations to match those of listing three (ML ROUTINE). You can now save the program. Type S"ART SPR",8,+3584,+4096 and press RETURN. Now, type S"ML",8,0B00,0B14 and press RETURN. You can now exit to BASIC and type in *The Artist*. Be sure to save *The Artist* before attempting to run it.

FUTURE EXPANSION

You may have noticed that the upper right hand corner of the Main Menu screen contains a large blank box. I purposely left this box blank for future expansion. Here is a brief description of how the cursor input routine works in case you would like to add some features to the program.

Lines 62-74 check to see where the cursor is along the y-axis when the fire button is pressed. Control is then transferred to the appropriate section (Lines 78-126) to determine where the cursor is along the x-axis. This is where the routine actually determines what function was selected. Take note of line 62. This line calculates the x and y coordinates of the cursor sprite and then translates it to x and y coordinates for a 40 column by 25 row screen. The upper left hand corner is location (0,0) and the lower right hand corner is location (39,24).

To demonstrate the process of adding new commands (options), I will show you how to add a BORDER command. This will allow you to change the border color of the graphics screen. First, we have to decide how the command will work. To keep things simple, I have decided that a box with the word BORDER in it will be used to activate the BORDER command. The user could move the joystick up to the box and hit the fire button to cycle through the 16 available colors.

The next thing to do is add the command box itself. I decided to add the command at Line 500. Here are the lines needed:

```
500  WINDOW24,1,39,14 : PRINT"[WHITE][8
" "][RVSON] ":PRINT" BORDER [RVSON] " :
PRINT"[8 " "][RVSON] ": PRINT"[RVSON][W
HITE][9 " "]": WINDOW0,0,39,24: RETURN
```

The first WINDOW command makes a window in the big blank box on the Main Menu screen. The BORDER command is then printed in the upper left hand corner of that box. The screen is then returned to normal with the second WINDOW command, and the program then returns from the subroutine.

To make sure that our new command is printed along with the Main Menu screen, we have to have a GOSUB to our routine from the routine that prints the Main Menu. Add the command GOSUB 500 to Line 274, right before the RETURN statement.

However, just adding and printing the command is not enough. We also have to add a routine to check for and activate the new command. Type in the following Line:

```
83 IFX>23 AND X<32 THEN C4=C4+1: IF C4
<17 THEN 52: ELSE C4=1: GOTO 52
```

We now have a command to change the border color. To finish things off, let's add a routine to save the border color information along with the picture data. Add the following statement at the beginning of Line 170: POKE 8172,C4. Now add this statement to Line 180 right after the BLOAD command: C4=PEEK(8172). We will also need to modify the BUFFER SAVE and BUFFER LOAD routine. Add the statement R4=C4 to the end of Line 230 and the statements C4=R4:COLOR4,C4 to the end of Line 242.

All the additional lines to add can be found in the Additional Lines listing.

Here are some suggested commands to add. How about COPY, HARDCOPY, or ZOOM? Or maybe a special effects command such as CYCLE. This command could be used to cycle through the border or background color of the picture. Some simpler commands to add would be disk commands such as DIRECTORY or FORMAT.

ADJUSTING THE PROGRAM

If you find that the computer reads the joystick fire button too fast, change the 150 in Line 322. Also, the CIRCLE function may not draw a perfect circle on your TV or monitor because it was adjusted for my TV. If the circle is too skinny, increase the value of the variable SC in line 280. If the circle is too fat, decrease the value of SC. As it is now, the border color is black. To change the border color, change the value of C4 in Line 280 to the number of the color you want. ☐

SEE PROGRAM LISTING ON PAGE 124

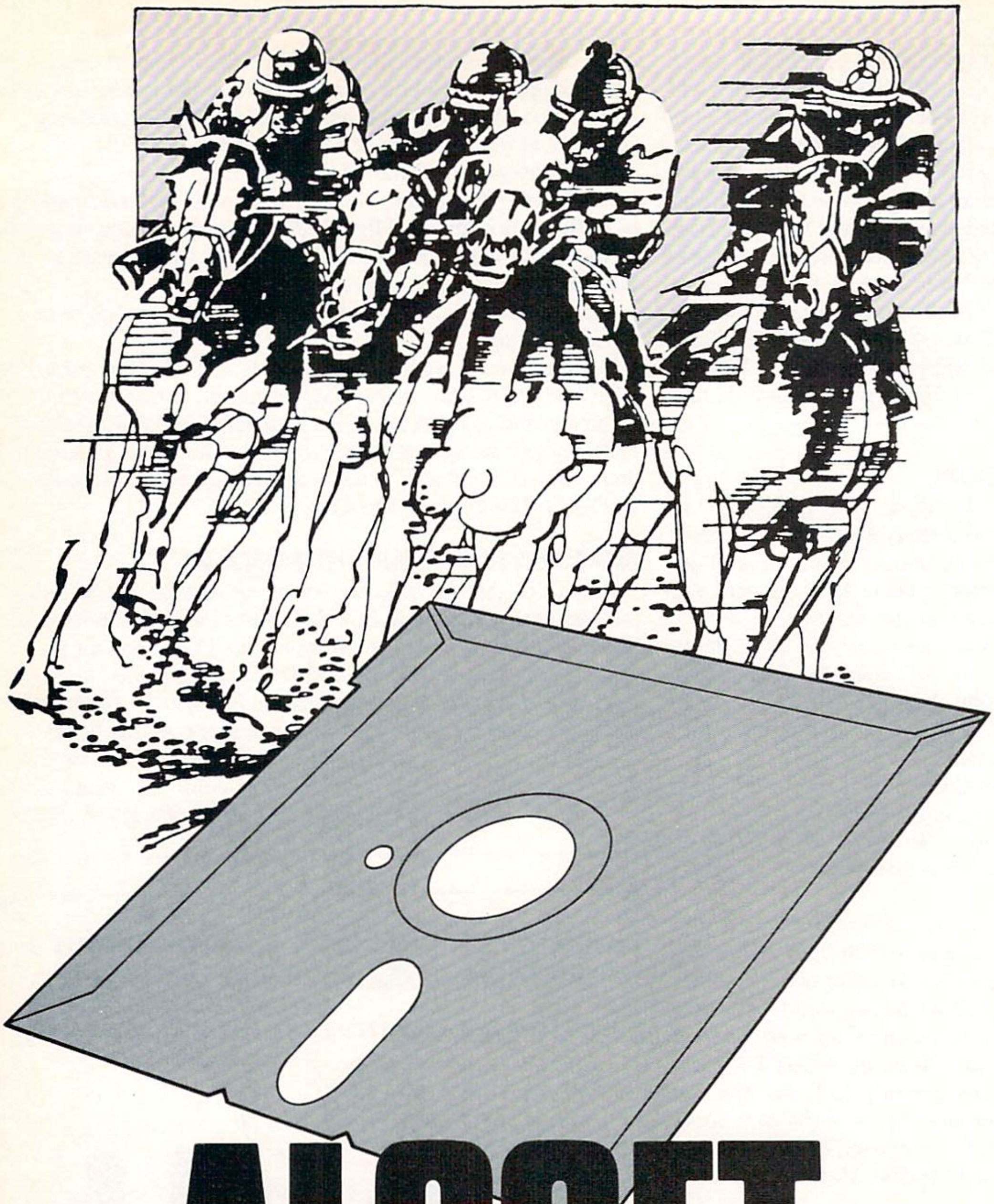
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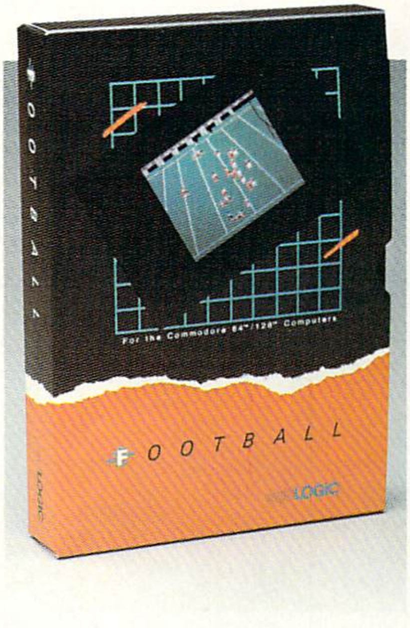
New titles give football fans lots of gaming choices

By Arnie Katz and Bill Kunkel

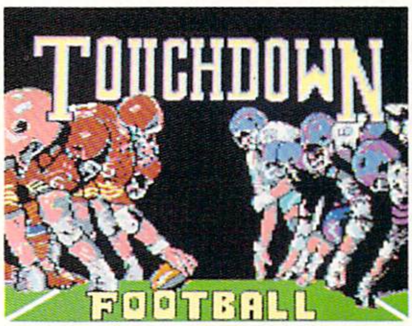
The United States Football League's challenge to the NFL's monopoly failed, but Pete Rozelle's group still isn't the only game in town for football fans. There's a stadium built into every Commodore 64 and 128, and software publishers have filled it with a rich assortment of great gridiron disks.

Four football games have appeared for the C-64/128 since *Ahoy!* last studied the category. As if that were not enough good news for computer sports fans, the new entries reviewed here represent a truly amazing variety of game-formats.

Whether the computerist enjoys pure arcade-style action or undiluted statistical accuracy, there's a first-quality game that can fill the bill. The four newcomers, together with the previously available *On Field Football* (Gamestar/Activision) and *Super Bowl Sunday* (The Avalon Hill Game Company), insure that there is a program to suit every football fancy.



Football *mixes action and statistics.*
READER SERVICE NO. 213



Touchdown Football: *8 formations.*
READER SERVICE NO. 214

Fans of action-oriented gridiron simulations can start dancing in the end zone: Electronic Arts has released a Commodore version of Imagic's excellent *Touchdown Football.*

In this contest, the coach of the offense has a choice of eight formations, eight pass patterns, and three possible line blocking schemes, plus full kicking options. The defender selects from among eight regular and two kicking plays. All selections are entered via joystick, using a series of pull-down menus.

Once the strategy is set, the onscreen center snaps the ball. The user takes direct control of the quarterback and either guides him through the line on a rushing play or sets up for a pass to a previously designated receiver.

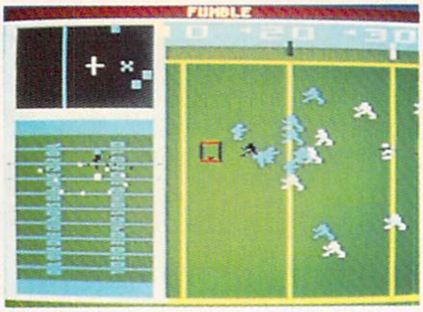
A completed pass causes control of the onscreen athlete to immediately shift to the receiver. A pass catcher can try to dart downfield for extra yardage. On defense, meanwhile, the computer coach maintains joystick control over the middle linebacker while the rest of the team moves according to the preprogrammed instructions.

Touchdown Football presents its two six-man squads in a realistic, three-quarters perspective with horizontal scrolling, visible officials, cheerleaders, and a pigskin that casts a shadow. There are punts, field goals, and even interceptions as the two squads march up and down the gridiron in this head-to-head or one-player action contest.

Unfortunately, this excellent program by Mark D. Klien, Michael Becker, and Wilfredo Aguilar was originally designed to be played on the 128K IBM PC and PCjr systems, and the translation to the Commodore 64 causes several problems. For one thing, the play entry system was created for use with a two-button joystick. In the original, one action button brings up the options and the other enters commands. Once the play begins to unfold on the field, the dual fire buttons allow the quarterback to throw to either the upper or lower wide receiver. While the lack of a second action button does not cripple the game, it significantly complicates the command control scheme.

Another noticeable flaw is that the graphics are not as sharp as one might expect in a game as sophisticated as *Touchdown Football.* The gamer must be able to follow the individual players as the lines collide, but this is often next to impossible due to the muddy animation.

Touchdown Football, even with these minuses, is still the best action football simulation around. The extensive choice of offensive and defensive plays and faultless joystick re-



WGFG: *create your own book of plays.* *READER SERVICE NO. 207*

sponse make for a realistic and thoroughly exciting program.

Although coaches control their helmeted warriors with the joystick in *The World's Greatest Football Game,* the accent is definitely on strategy. The documentation quotes an adage to the effect that football is 85% mental, and this Nexa-designed program attempts to live up to that maxim.

The main display shows three views of the gridiron with players represented by easy-to-recall symbols. The right side of the screen presents the sideline view of the teams as they line up at the line of scrimmage. The lower left side displays an overhead view of the entire field. An overhead close-up view, located in the upper left corner, allows the coaches to watch the offensive and defensive players execute their assignments. Pressing the "W" key toggles between single- and multiscreen displays.

The main menu screen has four icons which represent time-outs, moving to the scoreboard screen, loading/saving games, and exiting to the "choose play type" menu.

Participants call plays by using the joystick to select choices from a series of menus. First the offense chooses "run," "pass," "punt," or "field goal." If it is a rush or kick, the next choice if whether it is to go left, middle, or right. If the offense is passing, the coach first selects a long, medium, or short throw before choosing the direction in which the play should develop.

The next menu lists all the plays in the team's customized playbook which fit the parameters. A diagram of the selected play appears on the screen. The defense then chooses a setup from a menu, which it hopes will counter its rival's plan. After the offense determines the speed at which the play will unfold, *The World's Greatest Football Game* switches to its action phase.

The quarterback automatically follows his assignment from the snap until the coach decides to pass, handoff, or improvise. Audio cues make it comparatively easy to time the handoff on running plays or the ball-release for passing.

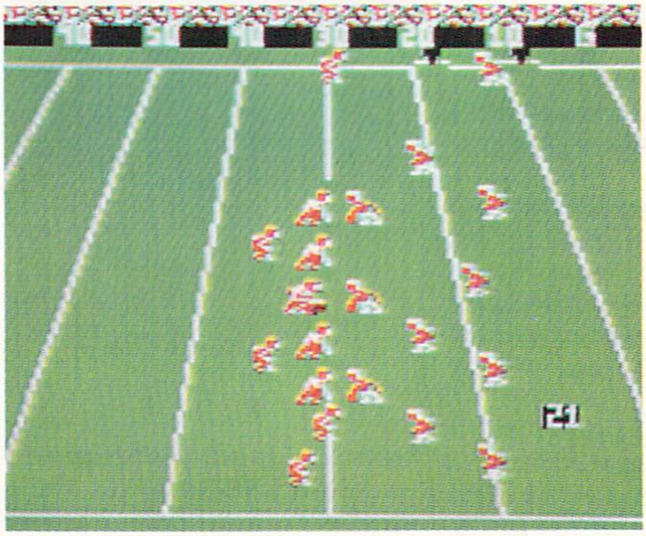
The joystick takes control of the running back or receiver, depending on the call. Meanwhile, the defense controls either a linebacker or a safety, depending on which man the coach feels will be more important in the current situation.

The heart of the game is the Chalkboard, a sub-program which gamers use to create their own book of plays. The process is well-documented in the instructions, but it takes quite a while to pick the right formation and delegate routes to the individual athletes. *The World's Greatest Football Game* is not for believers in the philosophy of "boot-and-play": Expect to spend at least an hour, and perhaps several, to compile a reasonably varied playbook.

This is a difficult, demanding game, which is best-suited for solitaire play, although head-to-head is possible. *The World's Greatest Football Game* is an intricately detailed simulation of the head games real coaches play with just enough action to keep things from becoming too cerebral.

Football (SubLOGIC) is an unorthodox mixture of action and statistics. The same team which produced *SuperBowl Sunday* (The Avalon Hill Game Company) designed this unique action-strategy game.

Football simulations replicate reality in a variety of ways. Action contests try to capture the patterns of movement, the "look and feel" of the real sport. The computerist should actually feel as if he's down on the field, busting tackles, throwing touchdowns, and sacking the quarterback.



Football ***depicts the gridiron in ¾ perspective with full horizontal scrolling. While the players tend to melt together at the line of scrimmage, the game does blend sophisticated strategy and satisfying action.***

The statistically based games, on the other hand, test the user's ability to evaluate and deploy real athletes in a simulated environment. In this variety of contest, the computer coach wants to feel like Don Shula, the general commanding his troops from the mountaintop.

Football walks both sides of the street simultaneously. The computerist is the coach, but also gets to feel the heat of personal combat. The result is a game which is tough to categorize. It should especially appeal to joystick jockeys who want a game that also involves a lot of strategy.

SubLOGIC *Football* is an action-strategy game. The coach controls the team of individually rated players with the joystick.

Teams are drafted from a talent pool of fictitious but very representative and well-drawn footballers. The play book describes each player in

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"Captain's Log, October 1, 1944. 0250 Hours. Fleet submarine USS Hammerhead proceeding Southwest at cruising speed. Our mission: intercept enemy convoy off the coast of Borneo. Disperse and destroy."

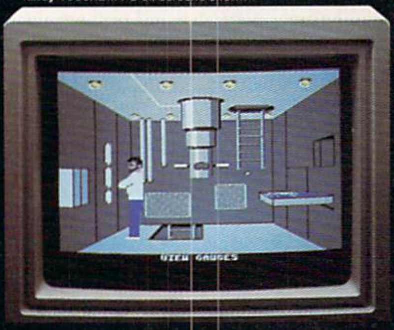
Tandy 1000/IBM PC Jr. screens shown



"0300 Hours. Two hours until dawn. Radar picks up convoy, escorted by two destroyers. We believe that one of the enemy's valuable cargo ships is part of convoy formation."



"0400 Hours. Lookouts on the bridge. Target identification party reports one cargo ship, 4,000 tons, troopship of 10,250 tons, with two *Kaibokan*-type escorts. Moving into attack position."



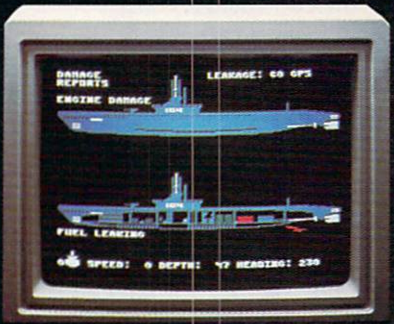
"0500 Hours. Sound General Quarters! Battle stations manned. Preparing for torpedo run. Gauge Panel OK. Periscope OK. Charts and Attack Plot Board OK. All mechanical systems OK."



"0525 Hours. Torpedo rooms report full tubes forward and aft. Battery at full charge for silent running. We hope water temperature will provide thermal barrier to confuse enemy sonar."



"0600 Hours. We are at final attack position. Convoy moving at 10 knots. Target distance decreasing rapidly... Crash Dive! Escorts have spotted us and are turning to attack! Rig to run silent."



"0700 Hours. Depth charged for one hour. Some minor damage, but repair parties at work. Destroyer propeller noises receding. We'll come to periscope depth for our return punch."



"0715 Hours. Torpedo tubes 1, 2, 3 fired. Two destroyers hit and sinking. One of the enemy's last cargo ships coming into 'scope view—an ideal target position. On my mark... Fire Tube 4! Fire 5!"



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Reader Service No. 227

considerable detail, including a biography, scouting report, and career statistics. Most players are rated for speed, power, and the ability to catch the pigskin. Quarterbacks have ratings for release time as well as for their ability to complete both long and short passes. The user can alter any of these ratings prior to the start of the game.

Before each play, the offensive team determines whether it will run or pass. There are seven rushing plays which can be sprung out of three possible formations: "pro" (two backs); "I-formation"; or "power 1" (three backs). On "pass" plays, the computerist chooses from among five basic patterns (post, flag, hook, slant in, square out) and four formations (pro, I, power-I, and four-receiver). It is also possible to run or scramble with the quarterback. A team can punt or attempt a field goal at any point. On defense, the player determines whether to set up for a run or pass play. On blitzes, linebackers are individually assigned, and if the pass defense is called twice in a row, the primary defender's speed rating is reduced. There are also several special defensive maneuvers. These include goal line stands, "keying" on runs, and a five-back setup for surefire passing situations.

Once the ball is snapped, the gamer on offense assumes limited joystick control over the quarterback. After a completed pass, the program transfers control to the receiver. On defense, control is assigned on a default basis to the "primary defensive player," generally the middle linebacker. The defensive coordinator may, however, change that assignment at any time in order to personally guide the movements of the strong safety, free safety, outside left linebacker, or outside right linebacker.

Football's graphics are acceptable, if unextraordinary. The gridiron is depicted in three-quarter perspective with full horizontal scrolling. The players do tend to melt together at the line of scrimmage, but the eye adjusts within a game or two.

This is really quite a remarkable game, though it is not for those who only become pigskin partisans at Super Bowl time. It offers a unique perspective on the sport. While it's hard for any program to be all things to all gamers, *Football* succeeds admirably in its attempt to offer a multidimensional simulation which blends satisfying action and sophisticated strategy.

If statistical accuracy is the goal, *3-in-1 College & Pro Football* (Lance Haffner Games) can put the ball through the uprights from any point on the gridiron. There isn't even a pretense of graphics, but no other pigskin program can touch this all-text title when it comes to precisely reproducing the performance of real football teams.

And what an incredible variety of teams there are! With a commendable spirit of generosity, designer Haffner has included hundreds of clubs from the past and present on the two disks supplied with the game. The latest edition features the 1985 NFL and USFL teams, 176 major college aggregations, 174 outstanding college elevens of the past, and 96 famous professional football teams. (The Canadian Football League is ignored, probably because that organization's rules differences would invalidate the algorithms which power the simulation.)

Like most stat game producers, the company updates its disks with the latest year's teams after the conclusion of each season. Team disks with the latest squads are available for separate purchase.

This one- or two-player contest plays rapidly head-to-head or against the computerized coach. The user can even sit back and watch the program direct both teams in pleasingly authentic "what if?" confrontations.

After the participants pick the number of contestants, the teams, and stadium, the main display appears. It isn't very fancy, but it does present the needed information in a succinct and easily understandable format.

Head coaches can tell at a glance which team has the ball, the down, yards-to-go for a first down, the position of the ball on the field, the quarter, and time remaining. The lower half of the screen presents menus of offensive and defensive options and prints out the results of each play.

Gameplay is quickly learned. First

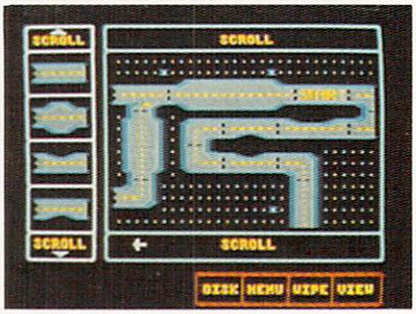
UNDER CONSTRUCTION

Fast Tracks / Activision

By Ted Salamone

Welcome to hard hat country. This is the first in a series of articles which will explore the intricacies of C-64/128 programs with screen editors and construction set capabilities. Be prepared to take a lot of notes. Since this work is pretty risky, keep that steel bonnet on at all times. Oh, one more thing: sign this waiver.

Fast Tracks is a slot car racing construction set. Would-be double shifters compete against three computer-directed cars on prebuilt or custom-designed tracks. Best of all, *Fast Tracks* makes it easy to send friends working copies of one's own world class tracks, complete with landscaping, worthy opponents, and fancy audiovisual effects. The recipient doesn't even need a copy of the program to enjoy your engineering and design feats.



Race on prebuilt or custom tracks.
READER SERVICE NO. 208

Cars in *Fast Tracks* roll along smoothly, hugging curves and streak-

the coach whose team is on defense chooses one of six alignments; honest, inside run, spread, blitz, short pass, or long pass. The offense then selects one of the five running or seven passing plays. (A team can also punt or attempt a field goal.) The program quickly compares the ratings of the players, modified by the interplay of the offensive and defensive strategy, and prints the result.

One of *3-in-1 Football's* best features is that it moves the ball in tenths of a yard. This is, therefore, the only football game in which a team can be stopped agonizing inches short of a first down or a touchdown. That is realism with a capital "R".

Appropriately enough for a game which embraces statistics to the exclusion of frills, *3-in-1 Football* includes a module which compiles season, game, and individual stats which can be saved on a formatted disk. Typing in the name under which the numbers are stored calls up complete records in a flash.

Lamentably absent is any mechanism for trading players. Lance Haffner has concentrated on replicating the performance of teams, not individuals. This game is more concerned with making the entire offensive line function correctly than with insuring that the left tackle piles up the proper number of blocks. Breaking up offensive and defensive units which worked together disrupts the game's complex formulas.

The play-system sacrifices user-involvement in the name of accuracy. The coaches pick only the plays, not who will carry them out. In other words, the computerist commanding the 1985 Giants can call for a blast over tackle, but the program decides whether Joe Morris, George Adams, or Rob Carpenter carries the ball.

An exacting simulation like *3-in-1 Football* is, of course, not for everyone. Even many closet Tom Landrys will recoil at the lack of visual excitement, but this title is surely the ultimate for Commodore owners who want total statistical verisimilitude.

And that's the computer pigskin lineup for this season. The established ones are still great, and the rookies add versatility and scope. with so many excellent choices, the Commodore computer may soon come to rival the flask as the football fanatic's best friend. □

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ing down straightaways, especially after a quick spin through the officially sanctioned rulebook. Besides operating information, the 20-page manual offers basic design and racing tips.

Tools of the Trade

Taking a cue from the original construction set title, *Pinball Construction Set, Fast Tracks* displays a parts bin on one section of the screen and a "workbench" on the other. Though the onscreen work area is only 5 standard track pieces high and 5 pieces wide, a complete circuit of up to 19 pieces wide and 10 high can be achieved using the scroll boxes above and below the workbench. Don't be fooled by this seemingly constricted space; intricate layouts are possible.

The parts box holds 22 different track sections and displays four at a time. Just like the work area, additional pieces are accessed by positioning the joystick-controlled cursor in the scroll box and pushing up or down. The course-architect selects and places parts by pressing the joystick button.

Straightaways include one lane wonders, two lane widow makers, and boulevard-sized roadways. A set of four 90-degree curves completes the basic components. Underpasses, overpasses, and intersections make tracks more challenging than the Detroit Gran Prix. Oil slicked sections, switchers (which randomly place cars onto connected throughways) and mergers (the opposite of switchers) add their own mischief to the mix.

The Blueprint

From the main menu, slot enthusiasts design courses, race on them,

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or create game disks for friends. Though track design is the first selection on the menu, it is best to start with the second, racing on predesigned layouts. Not only does such experience give the apprentice a good feel for the game playing portion of *Fast Tracks,* but it also is a solid foundation for designing realistic, challenging courses.

Once familiar with the courses included on the program disk, study other racing games for additional layouts. A less direct but nonetheless excellent source is photos and diagrams of the world's great raceways, such as the Brickyard, Lime Rock in Connecticut, or LeMans.

The easiest way to concoct a design for a new track is to lay it out on paper prior to booting the program. Graph paper isn't necessary, but it does make it easier.

Begin by placing the "start" track, then decide on the number and location of intersections, overpasses, and underpasses. Lay in the curves next, followed by the desired types of straightaways. The best time to add oil slicks is when fine tuning the course. Likewise, locate merges and switchers to tie loose sections together. Erase existing pieces to accommodate these final touches.

Pouring the Asphalt

During the construction process, the user places pieces on the work area as desired. Only a few rules must be firmly observed: Every course requires one "start" track, all tracks must connect to form an unbroken circuit, and *never* save anything to the *Fast Tracks* disk.

Follow the blueprint religiously, from placement of the "start" track to switchers and oil slicks. By this point in the design process, the user should have already made all adjustments on paper, so actual construction can proceed without a hitch. Though creation of a blueprint appears to be an extra, time-consuming step, it actually saves time in the long run. You'll avoid cost overruns and missed schedules due to "in the field" course redesigns. (It may also prevent you from arriving late to family meals and burning the midnight oil.)

Dots spaced evenly throughout the workbench make alignment easier when stretching pliable sections, or just placing standard units. This grid becomes even more helpful as work nears completion. Just remember, clean (non oil-slicked) vertical and horizontal straightaways are malleable. The others won't bend, stretch, or budge for anything or anybody. Threats don't work!

Previously placed pieces can be erased, individually or en masse. Other than a finite work space, there is nothing to prevent you from duplicating sections, with the exception of the "start" track. Most engineers would swap a Porsche 959 for this combination of design power and ease of use.

When the track is completely laid out as planned, save the masterpiece to an initialized disk. The "create track" routine includes four disk options: load, save, delete, and initialize. To reduce the size of stored tracks, landscaping is done by the *Fast Tracks* program at race time. Simple track configurations occupy as much as 33 blocks on a disk.

In a nutshell, the entire process goes something like this. Load *Fast Tracks* and design a course; save the finished product to an initialized disk, and test via the race option. Replace the data disk with the program disk, then do the reverse when prompted. The new creation appears onscreen in synthetic 3-D, replete with greenery, an appropriate musical score, and sound effects.

This advice applies even when duplicating existing tracks from diagrams or photos. Remember, almost any real-life track will probably have to be adjusted to fit within *Fast Tracks'* parameters.

Tips

Don't keep *Fast Tracks* in overdrive; extremely complex courses are no fun. Besides being nightmares to design and construct, they often fail when it comes to racing. A single merge/switch set is enough. Two or more such combinations create roadways that look more like congested interstates than high-speed race courses. Use oil slicks sparingly as well. Three on a course should be the maximum under normal design conditions.

The "real" world is more forgiving when it comes to overpasses and underpasses, though the finite course size tends to limit these. Strategic location of over/unders adds spectacular racing and visual excitement.

Fast Tracks' most useful track sections are those which can be stretched. Sprinkle a few (short) boulevard-size sections (to allow passing) to break up single-lane portions of the course. This forced course control builds tension and often frays nerves when competing against friends. Who will be in position when the track widens? Who will pass on the inside?

The Test Drive

In operation, *Fast Tracks* plays like a real slot car set. Speeding cars fishtail around turns, hanging over the track edges as if they were about to launch into space. Sometimes overzealous driving does send a car careening off the track, but none, as far as is known, has attained Earth orbit.

The graphics are better than average, and the musical score and sound effects are at least adequate. Apart from the construction set, playability is the byword. Slot car Andrettis need plenty of practice; the computer-controlled cars provide stiff competition. Pay particular attention to the fine art of bumping.

For the glory seekers, a top five scoreboard reports the results of all five lap contests. The single and ten lap contest results are not saved for posterity.

What Activision says about *Fast Tracks* is true: "The only problem you will have...is deciding which is more fun: building a track or racing on it."

Activision, Inc., 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410).

—Ted Salamone

Back issues of Ahoy! are available for $4.00 each. See page 98.

ULTIMATE WIZARD
Electronic Arts
Commodore 64
Disk; $29.95

Occasionally, a program comes along which reminds gamers that adventures and head-busting strategy contests aren't the only types of computer entertainment. This jumping and climbing epic spotlights joyously lighthearted arcade-style action with a secondary emphasis on seat-of-the-pants strategizing.

Wizard, designed by Sean A. Moore and Steven Luedders, was published a couple of years back by Progressive Peripherals and Software. Electronic Arts has taken the original design and added 20 more screens and a playfield construction kit. Paul Reiche II, Aaron Hightower, and Craig Smith, the main contributors of the enhancements, rate kudos for elaborating the *Wizard* concept with such sensitivity and spirit.

The player uses the joystick to roam a series of playfields. In each case, the goal is to find a key and fit it into the lock. There are point-scoring treasures to collect, and an assortment of stationary and mobile dangers to overcome.

Working fast is desirable, though not mandatory. The player can pick up bonus points by working the lock on the playfield before the timing bar in the lower left corner runs down. Sometimes greed and speed run afoul of each other, and the gamer has to make a split second decision about whether to snag the extra jewel or go for the bonus score.

The computerist directs a wizard in conical hat, so it's only natural that picking up the key on certain screens confers the ability to work a spell. The nature of the incantation varies from situation to situation, but includes things like invisibility and the temporary ability to survive falls from great heights.

Ultimate Wizard isn't just for joystick jedi, either. There are six levels of difficulty, and the game can be conducted at 10 different speed settings. The slowest ones are leisurely enough even for those of us who no longer dare show our faces at the local family amusement palace.



Ultimate Wizard: ***20 new screens.***
READER SERVICE NO. 209

The sound and graphics are charming. The wizard's arm-flailing tumble and stars-circling-the-head landing are worthy of a Saturday morning cartoon show. The wizard's walk is not well-animated, but overall, this is a great-looking Commodore game.

The instruction folder explains the construction module very well, but most computerists will want to conquer many of *Wizard's* 100 standard screens before venturing to create new ones. There are 20 different monsters and a choice of a dozen spells (including none) to spice up the user's own designs.

Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404 (phone: 415-571-7171). *–Arnie Katz*

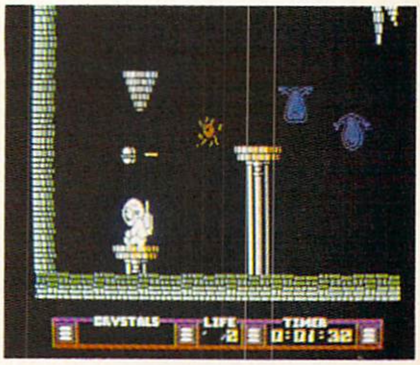
THE ARC OF YESOD/ THE NODES OF YESOD
Firebird
Commodore 64
Disk; $19.95

The British have a unique sense of humor and a distinctive approach to action computer games. They seldom break fresh ground in theme or format, but their implementation is excellent. While the games don't always suit the American taste, the multiprogram packages which Firebird now markets give players on this side of the Atlantic an opportunity to sample some of the big U.K. hits at a really attractive price.

This two-part adventure stars the Rt. Hon. Charlemagne Fotheringham-Grunes, "Charlie" for short. The computerist employs the joystick or keyboard to move the hero around the well-drawn playfields, which are full of precarious plummets and ravening monsters.

The Arc of Yesod is a quest for a monolith that's really a computer. Charlie found it once on the moon, but it was whisked away before he could destroy it. Now it's on a planet called Ariat. The computer contains knowledge that could enable aliens to destroy earth, so Charlie must risk his three lives in an effort to find it and take the critical data.

The Nodes of Yesod extends the scenario introduced in *The Arc of Yesod.* Charlie is still looking for the monolith, but this time the intrepid adventurer must gather eight keys to get to the elusive object.



Arc/Nodes of Yesod: ***2-part quest.***
READER SERVICE NO. 210

Charlie has special powers which help him battle the monsters which infest both adventures. In *Arc of Yesod,* a push of the joystick ejects a floating sphere from the astronaut's head. This highly mobile weapon can clear the skies, at least temporarily, of monsters. This gives the user time to concentrate on the tricky joystick maneuvers which are necessary to get Charlie through the action-quest.

Charlie doesn't really have a "special power" in *Nodes of Yesod,* but he can befriend a molelike creature before entering the caverns below the surface. If he does so, pushing the stick up frees the creature, who obligingly digs a tunnel for Charlie.

Like too many British imports, the documentation for this pair of contests verges on the enigmatic. The instructions don't even advise the gamer whether the creatures should be killed or merely avoided. The section on *Nodes* is hazy on such crucial details as how to cozy up to a mole and

what effect placing the gravity rods has on collecting the keys.

These things the computerist must learn through laborious trial and error. UK gamers reportedly prefer to learn as they go, but it is a good idea to provide more elaborate explanations in the documentation for programs which are to be sold to the American market.

Weak documentation doesn't automatically imply a bad game. Those who overcome the sketchy rules will find a pair of enthralling contests which invite repeated play.

The graphics are outstanding, certainly well beyond anything you might expect for about $10 per game. The astronaut is well-drawn and realistically animated. His jumping, though difficult to control at times, is nonetheless extraordinarily eye-pleasing. The underground caverns, which serve as the playfield for both games, are expertly drawn and alive with beasties of every description.

The musical scores of *Arc* and *Nodes* are on the same high level as the pictures. The insistent beat of these jaunty tunes encourages the player to plunge into the unknown, to take risks.

The troublesome documentation shouldn't put anyone off these enjoyable action-adventures. Vague rules can be overcome with a little study, and the reward is a couple of entertainment bargains.

Firebird Licensees Inc., P.O. Box 49, Ramsey, NJ 07446 (phone: 201-934-7373). *—Rick Teverbaugh*

ELITE
Firebird
Commodore 64
Disk; $29.95

Elite is nothing less than the high point in the history of British software design. This ambitious science fiction strategy contest presents the full breadth of trading and skirmishing in the vastness of intergalactic space.

A player begins as a recent graduate of an interstellar pilot's training course. The new spacefarer owns a Cobra Mk III, a fighter-trader with everything from dual Zieman Energy Deflection Shields to a choice of HoloDirect or ThruSpace GravDistort communication system, not to mention a rapid-fire pulse laser mounted on the forward hull. Unlike other software spacecraft, however, the Cobra's interior includes a cargo hold, bridge, drive sector, living section, and equipment level. As in every other aspect of *Elite,* there is plenty of substance below the surface.



For computer gaming's **Elite** *only.*
READER SERVICE NO. 211

The pilot uses the keyboard to gain access to a series of data screens. The Status page shows the current location, inventory, and the player's current rank. There is also a Galactic Chart, a Worlddata link with a readout on each planet in those systems, a local navigational chart, and a command to reveal the distance from the current location to any planet. In addition, the function keys control front, rear, left, and right views and steering. (Guidance functions can also be performed with joystick.)

The onscreen display includes the selected view and a series of console readings (cabin temperature, altimeter, gyro orient, flight grid scanner, compass, and forward velocity). The hyperdrive controls make getting around the eight galaxies a much less tiresome experience.



Macbeth *remains faithful to text.*
READER SERVICE NO. 212

Two things are immediately obvious about *Elite:* It is a meticulously detailed combat-trading simulation, and it will take quite a while to learn, much less master.

The program offers players numerous incentives to keep them studying. A pilot accumulates not only abstract wealth, but such down-to-Terra goodies as fuel scoops, docking computer, energy bombs, and extra pulse lasers. Acquisition of such prizes enhances the player's status, which starts out "Harmless" but can eventually be worked all the way up to "Dangerous."

The graphics are simple but pleasing line drawings reminiscent of vector graphics, well-suited to the 18 types of spacecraft which must be visually portrayed. The onscreen console display is so well designed that each readout is clearly discernable, even amid the welter of gadgets and gauges.

Documentation consists of the excellent "Space Trader's Flight Training Manual," which includes everything from loading instructions to primers on the Cobra navigation systems and politics in the space lanes (the likelihood of establishing trade with a planet might turn on its status as a Corporate State, Dictatorship, or Anarchy). A Quick Key keyboard control guide and a scene-setting piece of fiction, "The Dark Wheel," are also included.

Elite is one of the richest, most satisfying space simulations ever produced. Don't be put off by its complexity, either. We're all "Harmless" at first, after all, but with *Elite,* we become more "Dangerous" every day.

Firebird Software, P.O. Box 49, Ramsey, NJ 07446 (phone: 201-934-7373). *—Bill Kunkel*

MACBETH
The Avalon Hill Game Company
Commodore 64
Two Disks; $25

Double, double, toil and trouble await those who tangle with this two-disk adventure based on "Macbeth." Even armed with the copy of the play packed with the software, it's a long journey across the heath before the new king of Scotland is crowned. Not

for the fainthearted, *Macbeth* is a *tour de force.* The adventurer who stays until the battle's lost, and won, deserves a standing ovation for deciphering its murky passages.

Oxford Digital Enterprises authored *Macbeth* about a year ago in England. Now American computerists can follow their British cousins through the quartet of adventures which echo the plot of the play from its first scene to the curtain's fall.

The SID chip convincingly bagpipes "Amazing Grace" while the first episode loads. A view of Macbeth's dark castle against a stormy sky gives way to an animated sequence starring the three witches. As the shades twist and turn, subtitles deliver the opening lines, "When shall we three meet again? In thunder, lightning, or in rain?", concluding with the first real hint for the player, "Fair is foul, and foul is fair, hover through the fog and filthy air."

This clue may seem fairly foul when the gamer is entwined in the character of Macbeth. In action that borrows from the first four scenes of the play, the computerist must slay the rebel Macdonwald and assorted other warriors, while exploring the landscape. Only strict adherence to the play enables the user to solve the succession of puzzles. In fact, the words of the commands which the players type in on the keyboard must be taken direct from the text. A gamer can't just find a weapon and kill Macdonwald. Hints direct the gamer to the exact speech required: "Unseam Macdonwald with the axe." Next the gamer must afix Macdonwald's dripping head to the castle battlements, since that is how Shakespeare wrote it. Later, for exactly the same reason, Macbeth has to cut off a pilot's thumb in a gory bit of accuracy that seems overly bloodthirsty.

This reliance on the Shakespearean text plagues *Macbeth* throughout the tale. The parser for each episode understands roughly 80 words, and, in some instances, accepts full sentences. The computerist must have the play in hand at all times, to refer to the original for clues on how to proceed.

The second adventure, based on Scenes 5-11, features Lady Macbeth in a timed race to gather the contents of the king's stirrup cup, prepare the banquet, and persuade Macbeth to commit murder, then clean up after the foul deed.

Scenes 12-20 inspired the third adventure. The computerist must collect the ingredients for the witches' bubbling cauldron. The character moves through a beautifully drawn graphic world to locate the materials mentioned in the incantations in Scene 18. Even the clues which the player gets by typing "help" are only of minimal value in this section, since they appear in the form of riddles.

Part four is another timed adventure, based on Scenes 21-31. As Macbeth, the gamer must repulse the invasion, stop the fire, and prepare for the arrival of Macduff—then kill him before he disposes of Macbeth.

The graphics accompanying each adventure are atmospheric and, for the most part, evocative of the play. Many drawings are enlivened by touches of animation. Occasional bits of bagpipe music add a highland air to the proceedings.

As a bonus, there are four separate programs that let the computerist undergo "psychoanalysis" in the role of Lady or Lord Macbeth. The computer asks a series of multiple choice questions that explore each character's motives and feelings. It is not very complicated, but it is a painless way to familiarize oneself with the thought processes of these two ambitious schemers.

Macbeth is a delightly exercise for a Shakespeare lover. By referring to the play, studying the copious notes provided with the software package, and a great deal of trial and error, it is possible that a Macbeth student might actually be able to complete the four adventures. As such, *Macbeth* may have great appeal to those with scholarly interest in the topic, or as an educational tool.

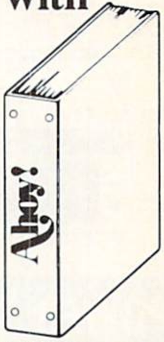
But the average gamer must anticipate many puzzling hours, made more painful by the lack of a save option. Perhaps the publisher should have scrapped the psychology game and used the space for a save feature.

For many people, the challenge will prove too much. As the Bard himself said, "The play's the thing," and the action here is too closely tied to the dramatic work to be all that much fun. It might make a good gift for a high school or college English student who wants to get "inside" Shakespeare's classic characters.

Avalon Hill, 4517 Harford Rd., Baltimore, MD 21214 (phone: 301-254-9200). *—Joyce Worley*

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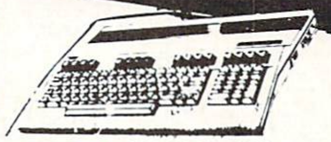
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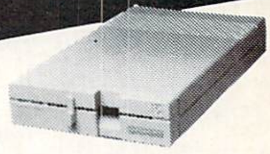
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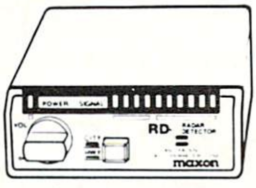


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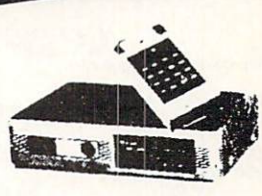
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Reader Service No. 248

MINOTAUR MAZE

For the C-64

By Cleveland M. Blakemore

Almost everybody is familiar with the mythological creature called the Minotaur, who inhabited a complex maze on an island in Crete in ancient Greece.

Less well known is the Minotaur's name, Dexter; and the fact that Dexter had a half-brother named Elrod who helped him comb the maze when he wasn't busy with odd jobs at the Greek rodeo.

Of course, their father, Smiling Jack Taurus, was the one who ended up as triple ground chuck roast when Perseus took the long way home after killing the Gorgon.

Anyway, the game is a simple, graphically interesting maze game of the classic variety. Two Minotaurs wander the maze, following the "left turn" rule. Under this programming logic, they will always take a left turn when confronted with a choice of more than one path. The player uses this knowledge to find suitable hiding places when the Minotaurs pass. Under this logic, the Minotaurs will eventually explore every possible inch of the maze.

With a joystick in Port 2, your player, a gray figure in the upper left corner, can move in four directions. The object of the game is to grab the precious gems scattered throughout the maze. The Minotaurs also collect them up as they journey through the maze. You get 50 points for every gem you grab.

When the maze is devoid of gems, return to your starting position at the far upper left corner, and a new maze will appear, filled with gems. You receive a bonus of ten times the number of gems you captured each time you move to the next level.

There are eight mazes in all, each one completely different, each one a different color. Number eight is the "Night Search" maze. It is totally dark, except for the torch you carry with you that illuminates every adjacent block around you. This level is very difficult to survive, but if you do, the maze starts again at number one, with the Minotaur's speed picking up a little.

Each time you complete eight levels, the Minotaurs get a little faster. After 16 mazes, they really start booking, so you will need awesome reflexes to get the higher scores. After you complete eight mazes, the next maze will be white–the victory maze. Then the maze colors repeat over again. The higher level mazes have more gems.

You may be able to slip by a Minotaur without getting caught sometimes, but very rarely. You can try this if you get cornered.

Pulsing music beats in the background while you play, interrupt-driven.

You have four men per game. When all four men are captured, the game goes into demo mode until you press f1 to start a new game.

My highest score yet is 12360, and I am particularly adept at maze games, so you will need some practice to get this high or higher. The hardest part about the game is predicting which path the Minotaur is going to take as it approaches. Once you get this down, you have a good start.

You will notice this game is very short, although it is near commercial quality. Using redefined character graphics instead of sprites saves an enormous amount of memory, leaving more room for program logic instead of simply binary files of sprite data. Although a good sprite game needs at least 10 shapes (640 bytes), a game using character graphics requires only 80 bytes for 10 shapes. Although character graphics are not suitable for many applications, and sprites are more versatile, characters are very appropriate for games like this, and much easier to program with. Getting the collisions worked out in a sprite game is the worst part of the program task, but with character graphics it is simple, because a character has a POKE code that is unchanging and constant.

In this game I have used character shapes for the stone walls, the Minotaurs, your player, and the gems, with enough room to spare to use custom characters for the lettering in the title.

Enjoy *Minotaur Maze,* and watch out for Elrod and Dexter! ☐ *SEE PROGRAM LISTING ON PAGE 127*

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MOUSE IN THE HOUSE

For the C-64

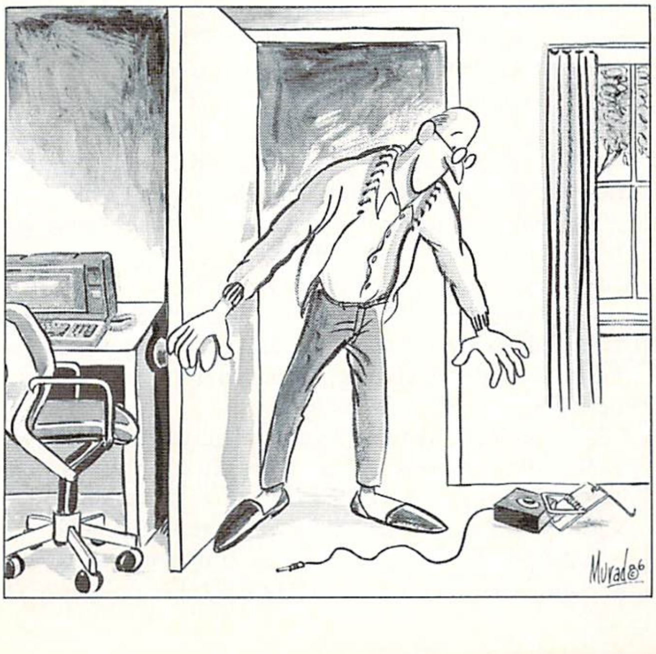
By James C. Hilty

Mr. Jones came home from work one day to a startling surprise—his wife was standing on the dining room table screaming. Between the "EEKS!" Mr. Jones was able to find out that there was a mouse in the house. Always one for overreacting, Jones went out and bought a cat and about one hundred mouse traps. He was determined to get that mouse.

Mouse In The House is a two-player game for the C-64. One player is the mouse and uses the joystick in Port 1. The other player is the cat and uses the joystick in Port 2. The objective of the game differs slightly for each player. The mouse must avoid the traps and the cat while trying to get the cheese. The cat must avoid the traps while trying to get the mouse. If the cat catches the mouse, the cat receives 10 points. If the mouse gets the cheese, the mouse gets 10 points. If either gets caught in a trap, the other receives 10 points. The game continues until time runs out on the timer. After every collision, the traps are rearranged on the playing screen. The cheese doesn't remain stationary. Just before moving to a new location, the cheese will turn green.

After testing the game, I can find no real advantage to being either cat or mouse. Each seems to win its share of games. Different strategies will be developed by each player.

Mr. Jones is waiting for his wife to get down from the dining room table. Maybe you can help by playing *Mouse In The House.* ☐*SEE PROGRAM LISTING ON PAGE 143*



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Vizastar, the integrated spreadsheet, database and graphics program that has the Commodore 64 world raving, is now available for the C128. It boasts 80 columns, and has over 40K of free memory in the spreadsheet. Those who already own Vizastar 64 will be pleased to know that your existing files can be read by Vizastar 128. Also, you can upgrade to the 128 version. Call us for details and pricing.

"The only other comparable product would be Lotus 1-2-3 for the IBM PC; nothing in the C64 world comes even close to the features of Vizastar."
AHOY July 85

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INFO 64 Magazine, Issue #7

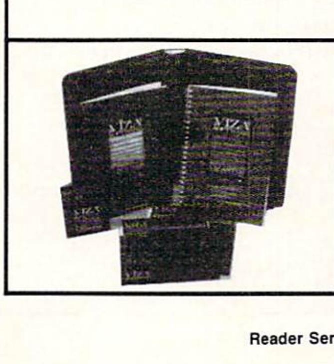
"Vizastar is an exceptional package that rivals the features of programs such as Lotus 1-2-3 and offers C64 owners the kind of integrated software previously only available for higher-priced systems."
RUN Magazine, June 1985

"I scrutinized, tested and experimented with Vizastar extensively, but could find no weaknesses whatsoever. It is the most comprehensive, most flexible, most powerful and easiest to use integrated software package I've worked with."
Commodore Microcomputer, Sept/Oct 1985

"I use an IBM PC at work with Lotus 123. I feel Vizastar is just as good and in someways better than 1-2-3."
Steven Roberson, NC. End User

"I have used Multiplan and Superbase; both are good pieces of software, but are inadequate when compared to Vizastar."
Jim Mathews, WA. End User

"So good, I bought a second C64 and Vizastar for my office. A wild bargain! You've saved me from having to buy IBM and Lotus."
Philip Ressler, MA. End User



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VIZAWRITE CLASSIC for C128

This is the new word processor from Vizastar's author, Kelvin Lacy and is the successor to Omniwriter, which he also wrote. All the features of Omniwriter are there, plus many significant enhancements, like auto pagination, on-line help, pull-down menus, full-function calculator and more. Up to 8 'newspaper-style' variable-width columns can help with newsletters.

Three different proportionally-spaced "near letter quality" fonts are also built-in for use with Commodore or Epson compatible printers. You can merge almost any other word processor file directly into Vizawrite, including Paper Clip and Omniwriter. Naturally, it is also compatible with Vizastar. At all times, what you see on the screen is exactly the way it will be printed out. Vizawrite can do mail-merges and has an integrated 30,000 word spelling checker that you can expand yourself.

PROGRAM SPECIFICATIONS

Both Vizawrite and Vizastar are written in 100% machine language and run in the 128's FAST mode, making it lightning fast. They require a C128 with 80 column color or monochrome monitor. Both come with a cartridge, a diskette, and a reference manual. Vizastar also includes a 50 page tutorial book. Both work with 1541 or 1571 disk drives.

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Reader Service No. 259

THE EDITOR

For the C-64

By Buck Childress

Oh, what a machine! The Commodore 64 has so many features that it's hard to pick a favorite. For programmers, the built-in screen editor has to be a front runner. It really makes editing a breeze. With all its capabilities, it's hard to believe that the new Commodore 128 could have more. But it does. It's really something!

With that thought in mind, why don't we take some of the 128's best editing features, add some it doesn't have, stir well, and pour back into the 64? We'll call it *The Editor!*

In addition to retaining all the regular editing features of the 64, *The Editor* allows fast and easy placement of the cursor anywhere on a line or on the screen. It has an easy erase feature, and the ability to insert blank lines wherever you want. You can escape the quote, insert, and reverse modes more efficiently. *The Editor* has 'typewriter' sound. Now you can hear what you're typing as well. This is really useful, especially if you touch type.

After saving a copy of *The Editor,* run it. The loader will POKE the machine language data into memory and check for errors. Once the loading is complete, type SYS 49152 and press RETURN.

USING THE PROGRAM

The CTRL key is used to activate the various functions. Press it simultaneously with the corresponding key.

You can tab eight spaces at a time in either direction. Press CTRL and f1 (function key) to tab forward. CTRL and f3 will tab in reverse. *The Editor* checks for the beginning and end of the current logical line and won't inadvertently tab off of it.

Oftentimes it would be handy if you could press a key and move to the end of the line you're currently working on. CTRL and f5 will do the trick. CTRL and f7 places you at the beginning of the line.

You can erase everything from the cursor to the end of the current line by pressing CTRL and the Greater Than (>) key. This is an easy key to remember, since it points toward the end of the line. Press the CTRL and Less Than (<) key to erase everything from the cursor to the beginning of the line (< points to the beginning).

Now that you can zip back and forth on a line, *The Editor* believes in giving you equal ability to move up and down on the screen. CTRL and RETURN moves the cursor down six rows at a time. If you're within six rows of the bottom, *The Editor* places the cursor at the bottom. CTRL and B moves the cursor to the bottom of the screen, regardless of your present location. Lest we forget, the HOME key moves the cursor to the top. I guess *The Editor* can't take credit for that feature, since it came with the 64. CTRL and CRSR UP moves the cursor up six rows at a time. If you're within six rows of the top, *The Editor* places the cursor at the top.

The Editor allows you to insert blank program lines in between existing lines. Let's say you're writing a program and want to add line 105 between lines 100 and 110. Using the old method, you would have to clear the screen, or cursor to the bottom (or wherever you could find a blank space), enter line 105, then list the program to have everything in order. With *The Editor*, just place your cursor anywhere on line 100 and press CTRL I. Bingo—a blank line has been inserted between lines 100 and 110. The cursor will be at the beginning of the blank line awaiting your command. If you do much programming, you'll like this goodie.

Ever find yourself inadvertently locked into the quote, insert, or reverse mode? Pressing the RETURN key isn't always the answer, especially if you're entering a line without a number (direct/immediate mode). It can make you lose your place or cause something to happen. Now you can escape by pressing CTRL and SHIFT.

The typewriter effect is 'built' into *The Editor.* All you have to do is adjust the sound on your monitor and type away. If you're touch typing, the sound insures that the keys are being pressed hard enough.

You can load, save, and work on all the programs you want without disturbing *The Editor.* If you wish to RUN your program, deactivate *The Editor* first by pressing RUN STOP/RESTORE. SYS 49152 will reactivate it.

Test drive *The Editor* and put your programming sessions in high gear! □***SEE PROGRAM LISTING ON PAGE 135***

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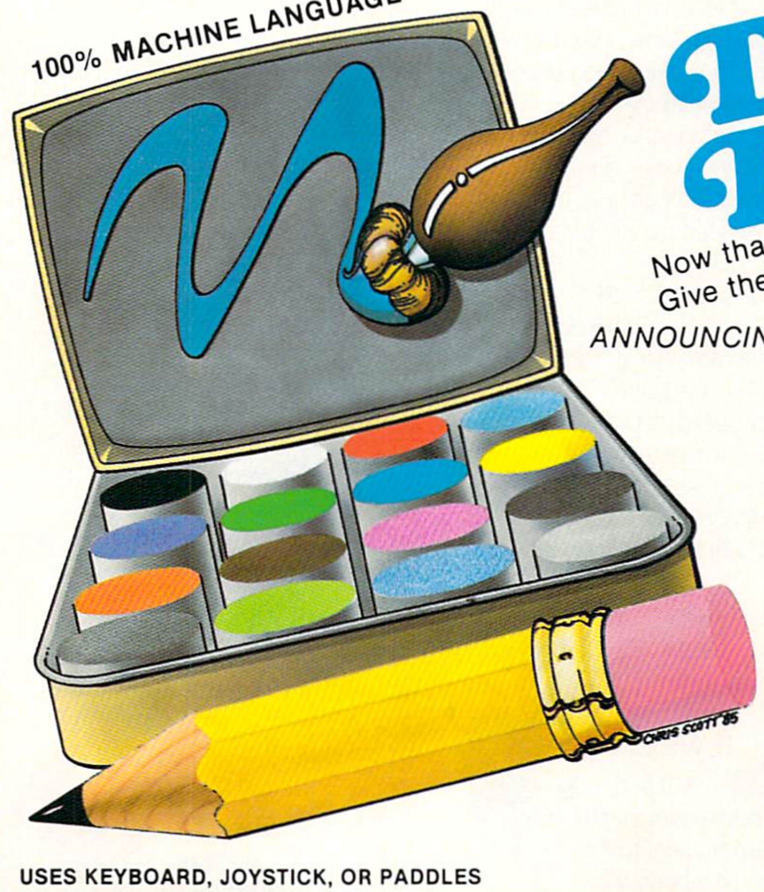
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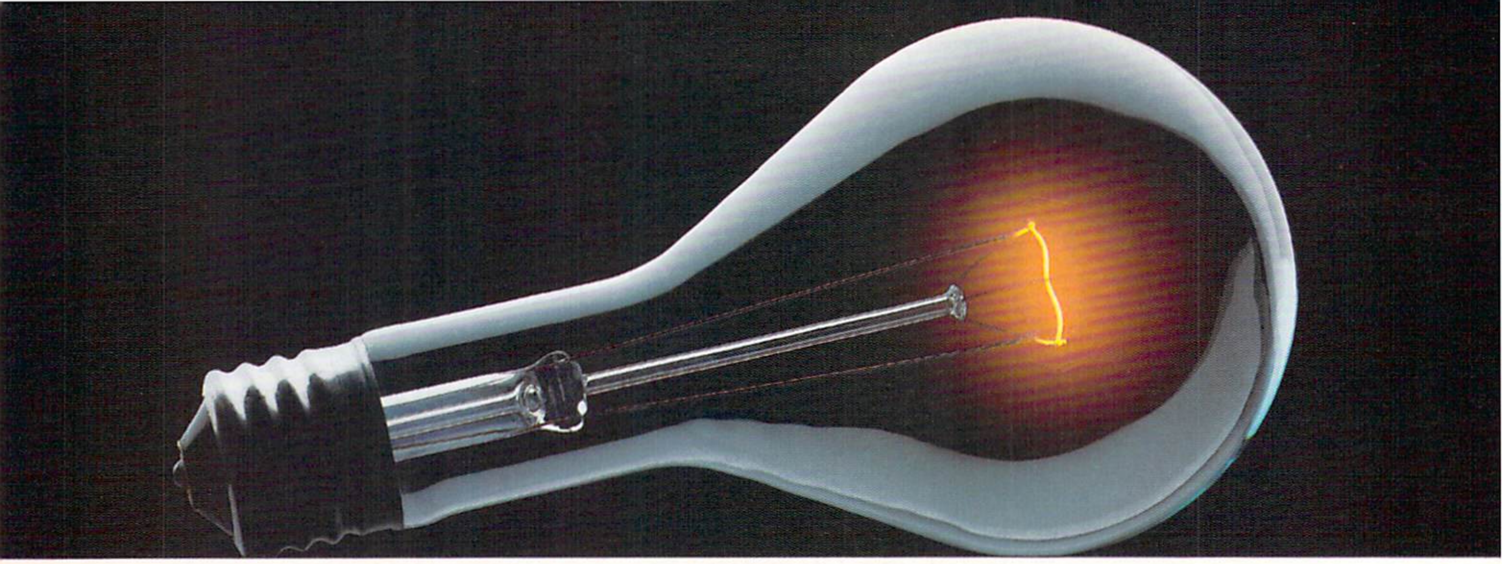
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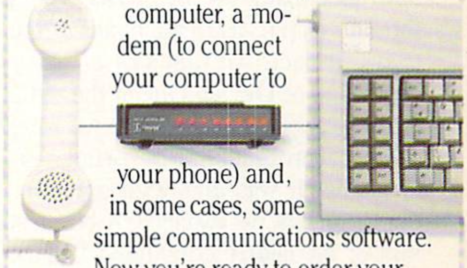
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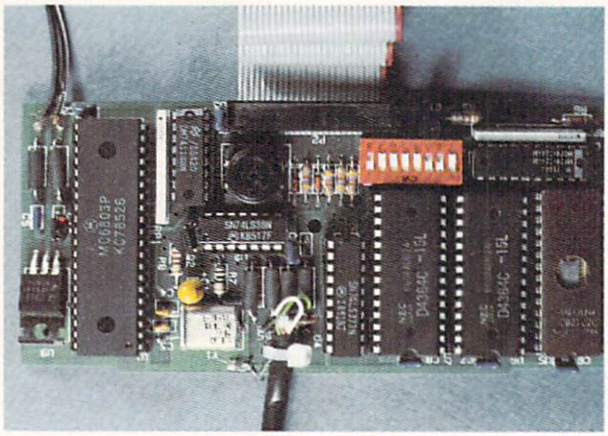
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Not just another pretty interface, Device One provides more features than we can summarize in a space this small. The circuit board (shown) packs over 2.6K per sq. inch. READER SERVICE NO. 233

PHOTO BY MORTON KEVELSON

Progressive Peripherals and Software is not a newcomer to the Commodore market. Over the years we have seen many worthy products pass through its portals to the hands of the users. In fact, we first saw an early prototype of Device One at the 1985 MARCA convention, where we were giving a presentation on printer interfacing. It was thus with great anticipation that we awaited our beta test unit of the nearly completed Device One.

Device One is a fully featured graphics interface for linking a Centronics-type printer to a Commodore computer via the serial bus. It performs the fundamental task of converting the serial data bit stream, as generated by the computer, to the parallel data byte stream required by the printer. In addition, as a graphics interface, Device One provides 100% emulation of the Commodore 1525 printer–an emulation which includes the entire Commodore character set as well as the 1525's bit map graphic capabilities. As with all current printer interfaces, Device One offers a choice among several degrees of partial emulation as well. These range from an easy to read mnemonic and keystroke translation of the Commodore control codes in program listings to a semitransparent mode with only PETSCII to ASCII translation. The latter mode is useful for sending non-Commodore control codes to your printer and with the C-128's CP/M mode.

"What's this?" we hear you exclaim. "What interest do we have in the emulation of an obsolete printer which has not been seen on a dealer's shelf for nearly two years?" It turns out that in spite of their shortcomings, the 1525 and its successors, the MPS-801/803, are the common thread which binds all C-64 printer-dependent software. Running in 1525 mode will virtually guarantee hard copy after all else fails. Besides, it is the only practical way to simply generate BASIC program listings from the VIC 20, Plus/4, and C-64/128 series of computers. For those of you who have recently come aboard *Ahoy!*, we strongly recommend the series of articles on printer interfacing previously presented (see sidebar, page 66).

The Hardware

We are not showing Device One in its final casing for the simple reason that it is not available at this time. The beta unit we received was squeezed into a Commodore surplus VIC 20 cartridge case (there seems to be an endless supply of these on the peripheral market). However, the unadorned circuit board shown here does appear to be the final version. The only significant changes we expect to see will involve shielding of the input and output cables to minimize TV and radio interference.

A quick glance at the accompanying photograph reveals a utilization of circuit board real estate which may be exceeded only by the concentration of office towers in downtown Manhattan. Upon this 12.5 square inches of fiberglass and epoxy we found no less than 16 kilobytes of RAM with an equal quantity of ROM, a 6803 8 bit microprocessor running off a 5 megahertz clock crystal, a 5 volt regulator, an eight position dip switch, one pushbutton, three TTL chips, and several miscellaneous electronic components. This works out to better than 2600 bytes per square inch: an unconfirmed record for a Commodore printer interface. The whole thing is externally powered by a nine volt DC black box wall plug module rated at 500 mA.

Since Device One is completely self powered, there are no concerns for the source of a 5 volt supply as with most other printer interfaces. This has been a problem particularly for users of the SX-64 and the Plus/4 computers, which lack the standard Commodore cassette port, the favored source of interface power for most manufacturers. However, note that Device One has no on/off switch. Its 115 volt AC supply should come from a properly controlled source such as a switchable power strip.

The 5 volt regulator and the 6803 microprocessor sit side by side at one end of the Device One's circuit board. As a result, that end of the board tends to run a bit warm. This seemed to have no adverse effects during our many hours of testing.

The eight dip switches perform the expected printer interface functions. Three of these provide eight possible printer settings, including the Canon PJ1080A color inkjet printer. Two more are for the four possible hardware operating modes ranging from full emulation to total transparency.

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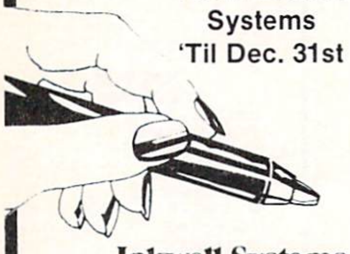
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On Big RAM Buffers

RAM is to computers as horsepower is to cars. We're not always sure we will need it, but we all feel that more could be useful. Computer advertising has not failed to exploit this attitude. The amount of RAM plays a prominent part in the promotion of every computer device that uses the stuff. In the November *Ahoy!* we went into considerable detail on the value of serial port buffering. The actual benefits to be obtained are strongly related to the speed of the printer and the data transfer rate of the serial port. Device One's built-in 16 kilobytes is an effective amount. It is nearly large enough to accommodate two bit-mapped screen dumps and more than adequate for letter-sized text files. However, the real value of the 16K buffer is not in how much printer data it may hold but in the alternate uses to which it is applied. Device One can store up to eight printer character fonts in its buffer. In addition, Device One uses its onboard RAM to optimize all its printer operations. We found its operating speed to be among the fastest we have seen.

What It Does

As a printer interface, Device One does a lot. As a printer utility, Device One does even more. In fact, Device One has so many features that it may be better thought of as a printer accessory than as a mere interface. The best part is that all of Device One's features are external to the computer. Thus no demands other than the issuing of commands are made upon the computer's memory.

We will concentrate on Device One's unusual features rather than go into the details of each and every one. However, we will let Device One speak for itself with regard to all of its capabilities. The chart reproduced on page 66 is the actual command summary printout which is generated by the interface.

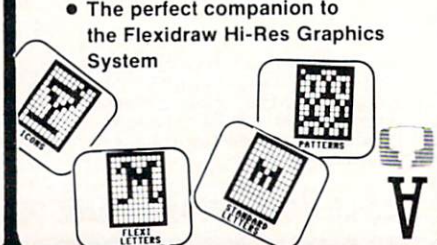
If you examine the chart you will notice that most features may be accessed in at least two and many times three ways. As with most interfaces, Device One responds to the secondary address of BASIC's file OPEN command. In addition, the interface has its own command channel (secondary address 15) which is very similar to the 1541 disk drive. Finally, while in emulate mode, a double escape code (CHR$(27)) will pass on the commands to the interface.

Perhaps the most popular feature will be the interface's custom fonts or character sets capability. Four fonts are stored in the interface's ROM. One of these is actually an emulation of the 1525 printer's font which even lacks lower case descenders! Now that's what we call emulation.

All of the interface's fonts, as well as the printer's own, may be printed in normal or near letter quality mode (NLQ). On the Star Micronics Gemini 10X printer, NLQ mode is a combination of high density (enhanced) printing and a double strike with a minute vertical offset. The result is a very good looking type. Of course NLQ does slow the printer down a bit, as two unidirectional passes of the printhead are required for each line of text.

In addition to the built-in ROM fonts and the printer's default font, the interface can store up to eight more RAM fonts in its onboard buffer. All of these downloadable fonts may be printed in normal and NLQ modes. The downloadable fonts come in four flavors. Lo-res fonts, based on a 6 × 7 dot matrix, are usable with all printers. Mid-res fonts, based on an

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8 × 8 dot matrix, are usable with all but the Okidata printers. Hi-res fonts, based on a 12 × 8 dot matrix, may be used with Star Micronics and Epson printers. A second hi-res font, based on a 16 × 8 dot matrix, is for use with the C. Itoh, NEC, and Legend 880 printers. The hi-res fonts occupy two slots in the RAM buffer.

Device One comes with a utility disk which includes one sample of each font type, except for the 8 × 8 font, of which there are 22 varieties. These include disk files of the four ROM fonts. The disk also includes a full featured font editor to let you create your own or modify the provided fonts. Most of the fonts are complete upper- and lowercase sets. Seven are uppercase only and two substitute the Greek alphabet and a mathematical symbol set for one of the cases. The utility disk also includes a font capture program which will dump an 8 × 8 font from the computer's memory. This may enable you to capture fonts from some other programs.

Fonts are one of the less exotic features built into Device One. Have you ever forgotten a date? With Device One you may never again. Just feed it a month and a year along with the appropriate prompt and it will spit out a complete calendar for that month. If you need a banner in 8" high letters, Device One will do that as well. What's more, you can use any of the fonts as well as underlining and other text features in the banner.

Download Mode

We've saved the best feature for last. Device One has a special "download" mode which does some pretty amazing things. Upon receipt of the appropriate command, Device One will recognize one of four classes of data files and treat each one accordingly. Text files will be sent to the printer both with and without PETSCII to ASCII conversion. Font files will be automatically stored in the appropriate section of the onboard buffer. An eight kilobyte hi-res bit map will be automatically formatted to the printer in four possible ways: large or small in either fulltone or halftone.

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Fulltone dumps may be further influenced by the status of the NLQ mode. Finally, directories will be automatically listed to the printer. All you need do is issue the appropriate command over the command channel or via a double escape code sequence and send the data to the interface via a file with secondary address one.

"Now that sounds great," we hear you exclaim, "but you have obviously taken leave of your senses. The screen dump sounds like a useful gimmick but aren't all interfaces supposed to send text files to the printer? Besides, what's the big deal about listing a directory?"

The real gimmick is that you don't have to send the data directly to the interface. From the time the download command is issued, Device One patiently listens for any and all serial bus file transfer activity between the computer and the disk drive. This could be a LOAD or SAVE operation or even a VERIFY. Once a file transfer commences, Device One greedily gobbles a copy of every passing byte till the file has completely gone by. Only then does processing begin. In the case of a VERIFY, the possibilities are awesome. Any of the four file formats may be passed on to and processed by the interface without disturbing the current contents of the computer's RAM!

In the case of text and directories, printing will start as soon as the file transfer is complete. Pictures are handled differently. Printing is delayed till a series of lines are sent to the interface. If these are all blank, just the picture will be printed. If the lines include text, it will overlay the image. This effect works well with a halftone dump as the image forms a background to the text. It is even possible to offset the image margin and print text and a graphic side by side.

Downloaded images must be pure, 8000 byte bit maps, stripped of all color data. *Flexidraw*, from Inkwell Systems, is the only graphics package we know of which normally saves images in this format. All others combine their image files, with the bit map's color information, in varying ways. To get around this problem,

the Device One utility disk includes a *Printerizer* program which will process the image files of 10 popular C-64 commercial graphics programs in both hi-res and multicolor formats. Hi-res images have a 320 pixel horizontal screen resolution, while multicolor files have only 160 pixels. The tradeoff is that the latter can support nearly twice the color diversity of the former.

The *Printerizer* does more than just strip the color from the file. It lets you manipulate the image for the most pleasing results. The colors are analyzed so the resulting bit map may be transformed to a shaded gray scale representation. The shading may be either a predefined fixed pattern or a randomized effect. You may also just strip the color or negate the entire image. All these effects are visually displayed and instantaneously reversible to the image's original state. This permits experimentation till the desired effect is achieved.

The download mode has one major restriction. It only works at normal 1541 speeds. Thus all fast loaders as well as 1571 fast operation must be disabled or removed. You will also discover many limitations to downloading when using commercial software. In this case all downloading should be done before booting the software.

With regard to commercial software, the Device One utility disk

DEVICE ONE COMMAND SUMMARY

```
DEVICE ONE SECONDARY ADDRESSES
  0  Upper case/graphics emulate
  1  Download mode, for fonts, pictures, text, and directories
  2  Semi-transparent, all DEVICE ONE special features active
  3  Semi-transparent with ASCII conversion
  4  Transparent with switchable linefeeds
  5  Transparent with no linefeed
  6  Transparent with ASCII conversion and switchable linefeeds
  7  Upper/lower case emulate
  8  Calendar, send mm-yyyy and DEVICE ONE prints that calendar
  9  Banners, all letters come out sideways and 8" tall
 10  Decimal dump
 11  Hexidecimal dump
 12  Hi-res screen dump, send all bytes from hi-res screen
 13  Upper case lo-res screen dump, send all screen bytes
 14  Upper/lower case lo-res screen dump
 15  Command channel
 20+ Lock the interface

COMMAND CHANNEL COMMANDS
Command channel commands can also be sent in emulate or semi-transparent
modes, simply send 2 escapes followed by the command.  Commands
may be stacked if sent to the command channel only, i.e. "UIB1."
  B    Banner mode
  Cm-y Print calendar, m is the month number, y is the 4 digit year
  DA   Download text file, print with ASCII conversion
  DLx  Download lo-res font (6x7), x is a number between 1 and 8
  DMx  Download mid-res font (8x8), x is a number between 1 and 8
  DHx  Download hi-res font (12x8/16x8), x is a number between 1 and 4
  DP   Download hi-res picture
  DT   Download text file, print in transparent mode
  D$   Download disk directory
  E    Empty buffer contents
  FLx  Enable lo-res font, x is between 1 and 8
  FMx  Enable mid-res font, x is between 1 and 8
  FHx  Enable hi-res font, x is between 1 and 4
  FRx  Enable rom font, x is between 1 and 3
  FS   Standard font
  FUx  Font underline, x=1 for on, x=1 for off
  FXx  Font expand, x=1 for on, x=0 for off
  Gx   Print picture, x=1 for small, x=2 for large,
       merges picture with text that is sent subsequently
  Hx   Print picture in halftone, x=1 for small, x=2 for large
  I    Print the interface status message
  Lx   Special listing mode, 0 is off, 1 is on
  MLx  Set left margin, x is a 3 digit number or 's' for current
       cursor position, default is 1
  MRx  Set right margin, x is a 3 digit number or 's', default is 80
  Nx   Set NLQ mode, x=0 for off, x=1 for on
  PFx  Set last line of page (footer), x is a 2 digit number, default is 66
  PHx  Set first line of page (header), x is a 2 digit number, default is 1
  PMx- Set message line, x is a 2 digit number, follow the dash
       with whatever message you like, '#' will be replaced by the
       page number.  Turn off with PM99
  PPx  Set page length, x is a 2 digit number, default is 66
  P#x  Set page number, x is a 2 digit number
  Q    Print this quick reference sheet
  R    Release buffer, erases stored fonts and pictures
  Sx   Set bitsize, x=0 for standard, x=1 for proportional
  U    Unlock DEVICE ONE, undo effects of secondary address + 20
  #x   Set device number, x is between 4 and 7

FONT 3 SYMBOLS
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The publisher cannot assume responsibility for errors in the above listing.

comes with prepared printer driver files for use with *Superscript, Paperback Writer,* and *Word Writer 128* for the three most popular printer types.

The Final Feature

Last but not least we mention Device One's letterhead mode. This lets you set top and bottom page margins, as well as header or footer text to be printed on every page. This text can also be a downloaded bit map for printing in halftone mode on every page to create the effect of customized stationery.

TABLE OF *AHOY!* REFERENCES FOR PRINTER INTERFACING

1. March 1984, pp. 27-30: *Printer Interfacing for the 64 & VIC*
2. April 1984, pp. 19-25, 78: *Printer Interfacing for the 64 & VIC Part II*
3. April 1984, pp. 53-54, 94: *Lower Case Descenders with the VIC 1515/1525 Printers*
4. December 1984, pp. 19-21, 85: *Printer Interfacing Revisited Part I: The 1525 Printer—A Tutorial*
5. February 1985, pp. 103-108: *Getting the Words Across: Printer Interfaces for the Commodore Computers*
6. February 1985, pp. 108-116: *Printer Interfaces: Four Reviews*
7. March 1985, pp. 101-108: *Printer Interfaces: Conclusion*

Conclusions

There is no question about it. Device One has more features and a bigger buffer than any other interface currently available. It will be sure to shake up the current state of Commodore printer interfacing. Many of its features have proven to be quite addictive in the brief interval that we have had the interface. Although a number of these features are available as separate utilities or as part of other software packages, several are unique to Device One. There is also something to be said for having these features always online. The real question is just how much you are willing to pay for all this power. Device One's asking price is nearly double the going rate of its most feature laden competitor. The decision will be even more difficult for owners of a perfectly functional, albeit modestly appointed printer interface. As usual, it is you the user who will make the final decision.

XREF 128

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If you have ever programmed in a high level language on a mainframe computer, you already appreciate the value of a cross-reference utility. If your programming experience has been limited to microcomputers, a strong feeling of frustration may be your only indication that something is missing. In fact, the value of a cross-reference utility to the BASIC programmer is so great that we are puzzled that only Abacus Software offers one for the Commodore market. We find nearly as puzzling the fact that with no competition, Abacus has the nerve to charge so little for this product.

What *XREF 128* does is generate an organized listing of the line numbers on which virtually everything that is important in a BASIC program appears. The only things that *XREF 128* will not cross-reference are strings between quotes. If you have ever written, or analyzed, a BASIC program longer than 10 lines, you should immediately appreciate the value of *XREF 128.*

Although *XREF 128* lacks the bells and whistles (consisting of flashy colors and sounds) that many Commodore utilities feel obligated to provide, it does not lack convenience or operational flexibility. In fact, *XREF 128* may be tightly controlled to do only what you want it to do. This can be very useful when analyzing long programs. Searching, sorting, organizing, and formulating lists are time-consuming activities. The ability to limit a search and sort to specific items can be a great timer saver. *XREF 128* offers several degrees of flexibility for its sort criteria.

Your first selection is whether to cross-reference only BASIC keywords, only non-keywords, or both. Since the entire program is loaded into memory prior to analysis, choos-

ing only one item lets you analyze a larger program. Programs up to 53 kilobytes can thus be processed in two passes. *XREF 128* makes this very convenient by letting you analyze a program as many times as you like while changing the analysis parameters between passes.

The analysis may be further refined by specifying a starting and ending line number, keyword range, or variable range. All parameters are entered in response to screen prompts. Choosing the conveniently provided defaults will result in a listing showing the line numbers where all keywords, variables, line number references, symbols, and values are to be found in your BASIC program.

Since *XREF 128* listings, for all but the shortest programs, are apt to be lengthy, the preferred output device is the printer. Just in case, *XREF 128* lets you select device number and secondary address for your printer. If you wish you may opt for screen output. If you do you will find the C-128's NO SCROLL key to be an invaluable aid. Screen output may be viewed on either the 40- or 80-column display. However, the only benefit of the 80-column display is output visibility when using fast mode. *XREF 128* always formats screen output to 40 columns. The only other side effect of the 80-column display is that you will miss a rather vigorous, and lengthy, copyright message while the program loads.

As is our custom, we have left *XREF 128's* best feature for last. *XREF 128* gets its keyword token assignments from a disk file. This means that you can maintain different token files for extensions to, or different versions of, Commodore BASIC. While the manual specifically mentions Abacus' *Graphic System 128* as an example, we feel this feature will be of greater benefit for existing Commodore packages. Custom token files for C-64 BASIC extensions, such as *Simons' BASIC* or *Super Expander 64,* will let programs written for these extensions be analyzed on the C-128. Even programs for the *VIC 20 Super Expander* or the C-16/Plus 4 can be managed!

Of course a detailed knowledge of the keyword tokens for the BASIC extension under review is required. This can always be obtained by experimenting and PEEKing about, preferably with a machine language monitor. If *XREF 128* does encounter a token it cannot recognize, it will flag the corresponding ASCII value with a question mark. In any event, we can always hope that some altruistic user will generate the necessary token files and submit them to Abacus, who will see fit to include them on future releases of the program disk.

For modification of the token file, the KEYGEN utility is provided on the disk. *XREF 128* can manage up to 400 tokens. BASIC 7.0 uses about 170 tokens. All BASIC tokens have values greater than 127 (bit seven is always set). This limits BASIC to only 128 single byte tokens. BASIC 7.0 gets around this limitation by using two-byte tokens for most of its new keywords.

Operation of *XREF 128* is simple enough. Just respond to the onscreen prompts as they appear. The program to be analyzed as well as the token files will have to be on disk, but not necessarily the same one. If you cannot remember the file name, just enter a question mark and the disk directory will be displayed.

The printout is neatly organized with keywords first, numbers second, variables third, and functions last. All keywords are shown with an apostrophe as the first character. Keywords and variable names are limited to the display of only the first six characters. Just remember that BASIC only uses the first two characters to distinguish among variables.

At $17.95, *XREF 128* is a true bargain. Even if you value your own time at no more than minimum wage it will pay for itself the first time you use it. The only complaint we can find about *XREF 128* is that the program disk is copy protected. We would hope this would not be necessary on such a low-priced utility.

Abacus Software, P.O. Box 7219 Dept. HA, Grand Rapids, MI 49510 (phone: 616-241-5510).

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Having been one of the most prominent manufacturers of games and entertainment software for the Commodore 64 for years and not content with their dominance in that area, Activision has expanded into productivity software: word processors, spreadsheets, databases, and other serious home and business-related products. Following their purchase of Creative Software, Activision improved and rereleased *Creative Writer, Creative Calc* and *Creative Filer* as the first installments in their Personal Choice line. While these packages were originally designed to run only on the 64, Activision created better versions for the 128 and offers both in the same package. Though both programs in each module function similarly, the C-128 programs take advantage to the 80-column screen and faster operating speed.

Three for the Price of One

Though they can work together, the three programs can't really be called integrated, since files created with different modules aren't interchangeable. Integration between the *Filer* and *Planner* modules is nonexistent, though information from both of these can be included in documents created with the *Writer* module.

Reports from the *Filer* and *Planner* are easily imported into letters and reports created with the *Writer* package. If you need to do some editing to the information in the imported reports, they can be read into the *Writer* document and then edited to add fancy formatting commands or to delete unneeded data. Or, if you are trying to conserve space in your *Writer* document, an include command is used to read the second file in when the document is actually printed.

Information from the *Filer's* fields can also be used to replace variables in *Writer* documents. For instance, names and addresses from *Filer* can be used for form letters.

All modules are menu-driven. The first function key calls up the menu. Options from the menu are chosen by first letter. Disk functions are limited to creating, deleting, and saving files, though the modules will initialize data disks.

Though there is no function to copy a file, it's easy to save the file under a different name for backup purposes. I find this a serious limitation, as it is easy to forget to make backup copies of your work. In addition, there is the problem of saving the file under the same filename. Having to delete the original and then resave the new copy under the old name is a hassle.

One major change made was the documentation. The new manuals are spiral bound, easy to handle, and look durable. Each contains a short tutorial demonstrating an actual working session with the software. A reference section at the back explains commands and procedures. A quick reference booklet is also included.

The appendix section on printers explains the limitations of the Commodore printers, as well as the suggested switch settings for the various third party printers and interfaces. A few printer and interface combinations won't work at all.

Writer's Choice

Documents created are limited in size to 600 lines by 40 columns (24,000 characters) in the C-64 version, 500 lines by 80 columns (40,000 characters) in the C-128. While the C-64 can only display 40 columns, documents can be as wide as your paper will allow. By linking files, longer documents can be printed with consecutive page numbers.

Writer's Choice has most of the commonly desired word processing features. According to the print time options, you can print up to 999 copies and you can start page numbering as high as 999. A pause between pages option allows the writer to use single-sheet feed printers.

A menu controls page formatting features. Right justification is supported. Page numbers can appear at top or bottom or be omitted, but can't

be automatically incremented in the single header and footer.

Line spacing is also set from this print formatting menu or from within the document. Up to 10 lines of space may be put between lines of text. All margins are set from this menu. Left and right margins can be set in the document. Page length is also fully adjustable. You cannot specify a header or footer margin size.

The forced page break option is simple to use, but the widow prevention option is limited to five lines of text or less. Thus, a table might get cut in half.

Block functions (copy, delete, place, move, and save) are also simple. A find/find and replace option is included. Non-printing comments can be included for reference.

Format codes can be imbedded to activate a printer's special functions. These aren't explained, so you must be familiar with your printer and know what commands to send. Although boldface and underline are offered as control functions, the documentation warns that they only work with a couple of third-party printers.

A spelling checker program is included. It is not integrated into the word processor and must be loaded separately. Suspected misspellings are displayed in context and alternatives can be substituted as the mistakes are checked. New words can be added to a special dictionary that is also used. While not the easiest spelling checker I've ever used, it is certainly a nice option to have.

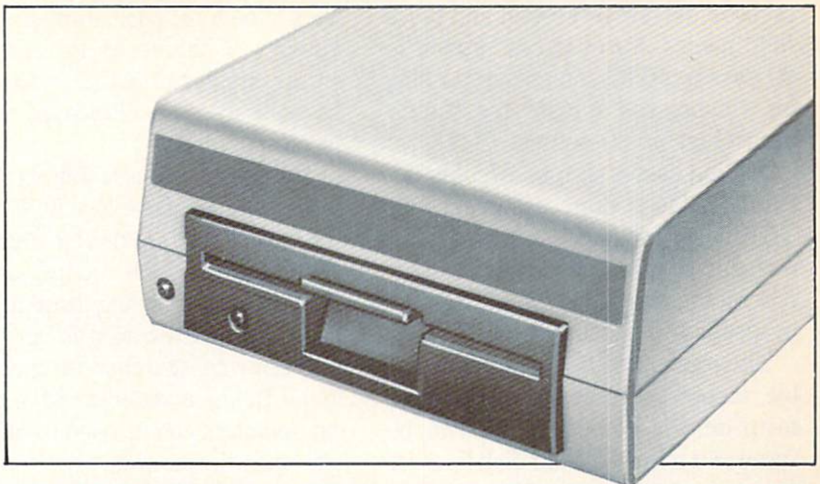
I did have one unexplained difficulty. The display is supposed to present information in the top and bottom screen lines. Both these lines were missing on my C-128's display. Since the top shows the current cursor position and the bottom the memory space used, it was an inconvenience not to be able to see them.

Filer's Choice

Filer's Choice offers features typical of most database programs. Individual menu options control creating the database form, adding data, searching for and modifying specific information, and printing out reports.

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The design form section is relatively easy to use. Arrow keys are used to move the cursor around and place field names. Form size is limited to 80 rows by 40/80 columns depending on whether you're using the 40-column C-64 or 80-column C-128.

Adding data is simple. Moving between fields is done using the RETURN key. Information from the last record can be duplicated to the current record saving typing. Entries can be printed individually.

The report formats are quite flexible, though not as easily set up as the form design. Report forms can be saved and retrieved from disk for later use. Reports can have a title and header. Page length, number of blank lines at bottom, page numbering, and number of characters for each field are specified at print time. Output can be sent to your choice of screen, printer or disk.

The upper leftmost field is the key field. One alternate key field can be selected. These are used to determine the order in which records are displayed when browsing through them.

The search function is very flexible, offering searches on any or as many fields as desired. Mathematical operators can be used to help isolate specific records.

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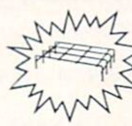
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Planner's Choice

Planner's Choice offers a slightly bigger spreadsheet than two top competitors, *Multiplan* and *SwiftCalc.* Its 255 by 255 cell work area is only slightly larger than *SwiftCalc's* 250 by 250, but four times as wide as *Multiplan's* 255 by 63. Of course, this means a tradeoff in features.

Cell size is easily set and adjusted. Rows or columns can be inserted anywhere provided there is enough room left at the outer edge of the spreadsheet.

Cell formatting options are adequate. Integer, fixed point, dollars, and left, right, or centered positions are offered.

Planner's Choice offers the most common spreadsheet functions: ABS, ATN, AVG, CNT, COS, EXP, FVL, LOG, MAX, MIN, PMT, PVL, SIN, and SUM. All the standard math operators can be in formulas. Cell references in formulas may be typed in or referenced by pointing them out with the arrow keys. Formulas may be adjusted as they are copied, so relative references are maintained.

Report margins, page lengths, and page numbers are set at print time. The program can be set to output ASCII or PETASCII. Control codes can be sent to turn on special print functions like condensed printing. Reports can be sent to screen, printer, or disk.

Conclusions

For a combined price of $100, these packages are good for folks on a budget. Though probably adequate for home users, some small businesses will push the capabilities to their limits and want something more powerful. Because it's uncomplicated, though, this isn't a bad starter system.

Activision, Inc., 2350 Bayshore Parkway, Mountain View, CA 94043 (phone: 800-227-9759).

—Cheryl Peterson

All programs in this issue of *Ahoy!* are available on disk. See page 87.


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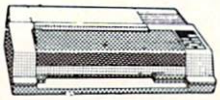
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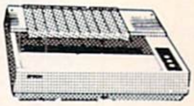
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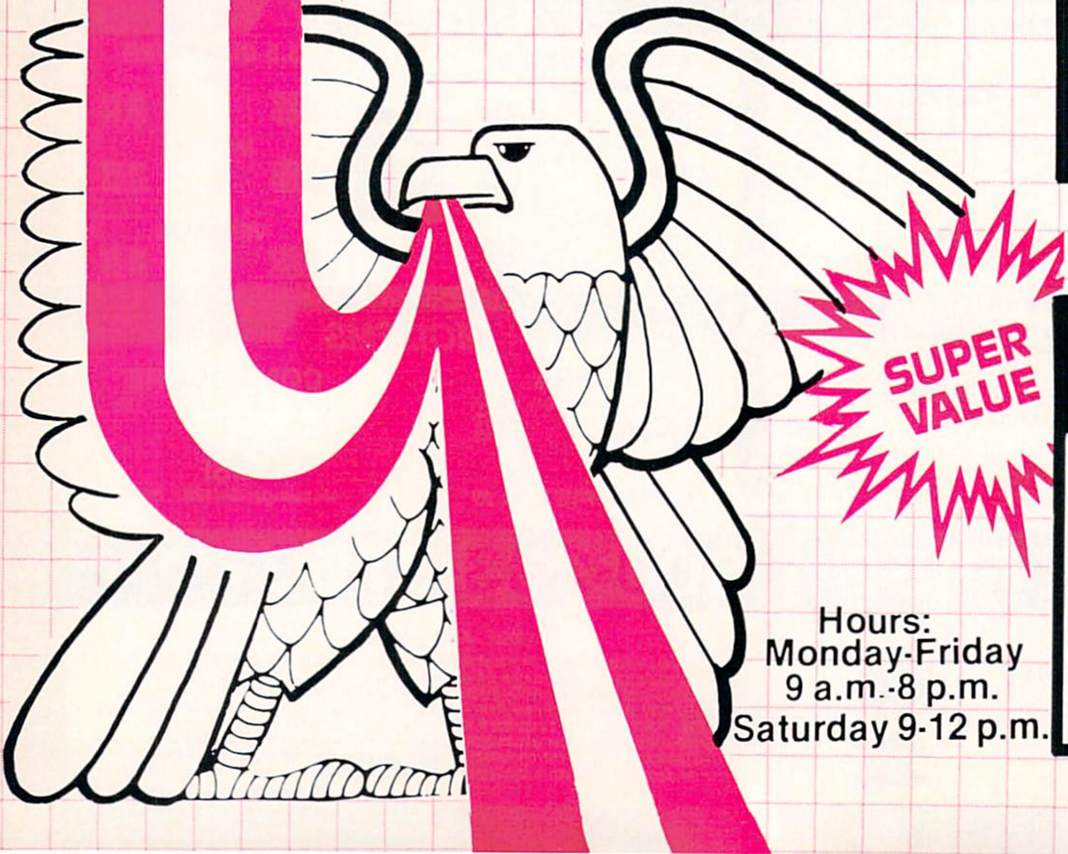
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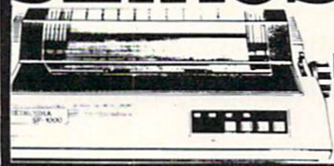
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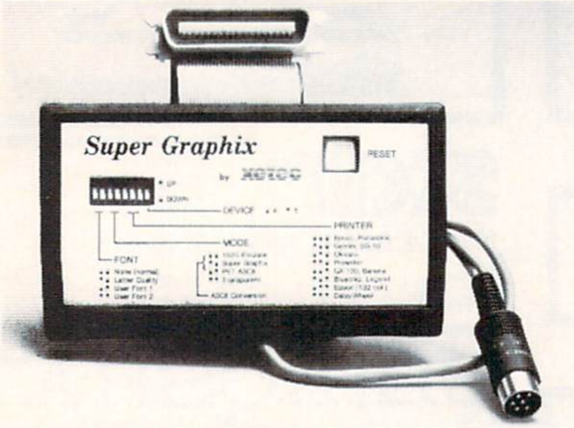
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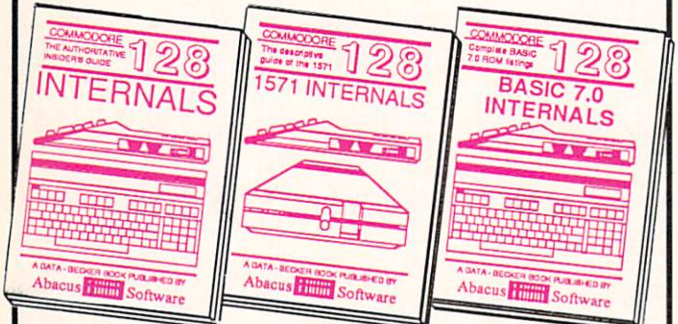
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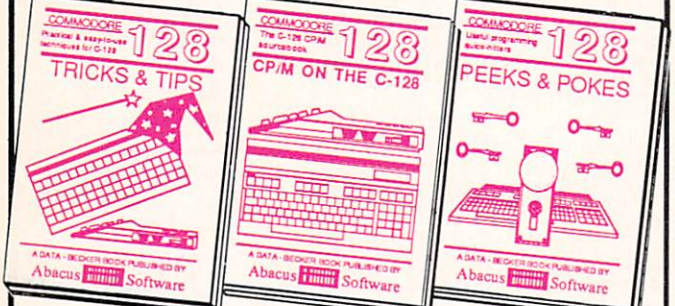
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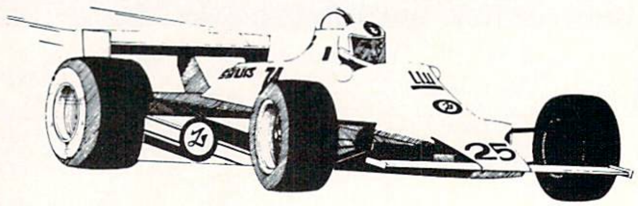
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Reader Service No. 273

SPEEDWAY

For the C-64



By Tony Brantner

Speedway is a racing simulation for the Commodore 64 which allows you to test your driving skills against the clock or another player.

At the start of the program, the title screen appears and you are asked to select the one or two player version. In the former, you have 60 seconds to complete as many laps as possible. In the latter, the first driver to complete 20 laps is the winner.

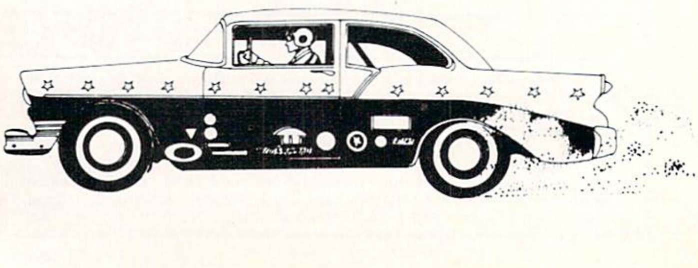
After selecting the number of players, you are shown four maps of the different tracks available, and asked to choose the one that you would like to drive on.

The third prompt asks you to select the road condition. On a dry road, traction is excellent. A wet track makes steering more difficult, while an icy track makes driving hazardous.

After making your choices, the game screen appears. A joystick plugged into Port 2 controls the red car, and if the two-player version is chosen, a joystick plugged into Port 1 steers the yellow car. Pressing the appropriate joystick to the right turns the car clockwise, and pressing it to the left turns the car counterclockwise. The fire button represents the car's accelerator. At the bottom of the screen, you will find the laps completed by the red car, the elapsed time, and the laps completed by the yellow car.

Should the two cars collide, they simply bounce off each other. Likewise, no damage is done if your car runs off the road. However, getting back on causes you to lose time, since the cars tend to get bogged down in this area. ☐

SEE PROGRAM LISTING ON PAGE 133



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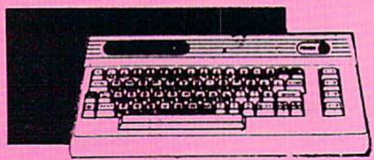
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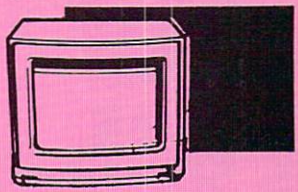
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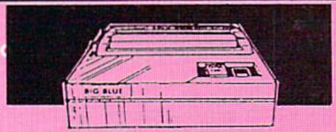
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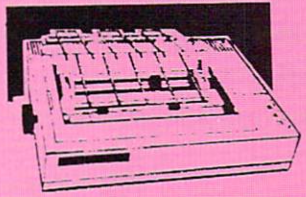
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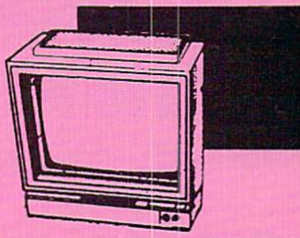
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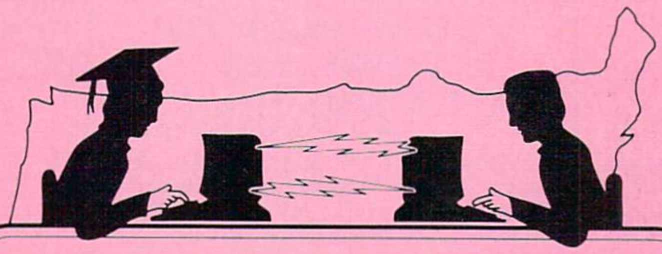
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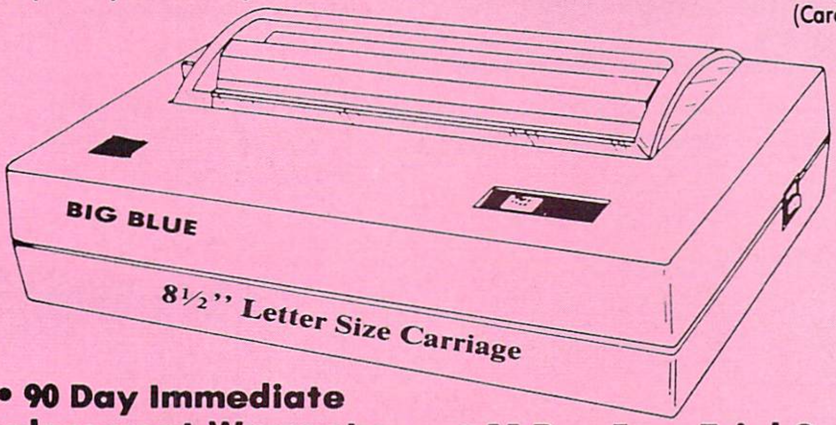
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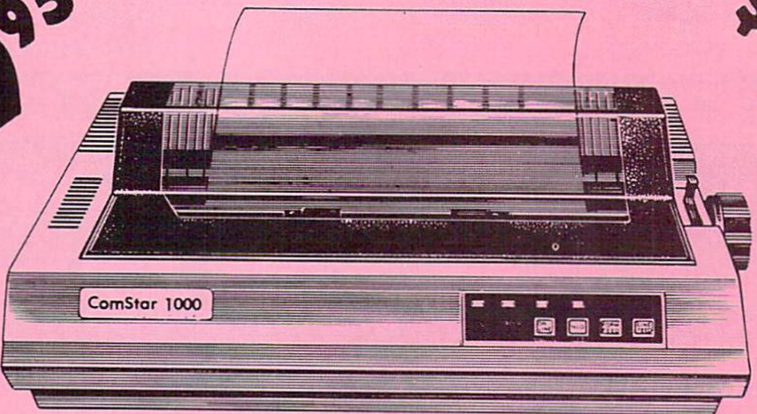
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LAZY SOURCE CODE

Mnemonic Shorthand for Phlegmatic Typists

By Michael Bennett

Those of you who enjoyed my *LazyBASIC* program (*Ahoy!*, June '86) will find a familiar format in this program which does for assembly programming what *LazyBASIC* did for BASIC programming. The onscreen menu has the same A-Q rows topped by the shiftless function keys (f1-f7) that must be hit prior to these letters in order to get a word to print out. But instead of BASIC keywords, the 56 mnemonic assembly instructions (such as "LDA" or "JSR") are listed alphabetically and can be accessed by two strokes instead of three. This program can be used alone or with a symbolic assembler program such as PAL or LADS, which allows you to type in your assembly as if it were BASIC.

If you think that a two for three savings of keystrokes is not impressive enough, how about two for thirteen? That is the maximum length of a labelname that you can define on the menu and then print out with two strokes. So instead of typing out "Spritepointer" every time you enter "JSR Spritepointer", you can define one of the nine labelnames on the menu to be "Spritepointer" and have it print out with two strokes. Defining the labelnames is a very simple process.

When you first load the program, the area of the menu where your labelname definitions will go is filled with my mailing address for feedback on this or *LazyBASIC*. If you were to hit f7 followed by the letter H at this point, the words "sendfeedback" would print out, with the space removed from between the words. Spaces are always removed, because that is how I achieved variable length labelnames on an easily altered menu.

Let's assume that you want to use that labelname "Spritepointer". First hit the RETURN key so that the whole menu is visible on the screen. This is an important step because the program recopies everything on the screen where the menu is supposed to be into the memory area where the menu data is stored. If only part of the menu is visible when you do this, only part of the menu will appear every time you hit the RETURN key from that point on. So hit the RETURN key as the first step in defining a labelname.

As your second step, cursor up to one of the labelname lines which are in column f7 in the rows H through P. Type in the labelname "Spritepointer" starting with the first space after the dash that follows the mnemonic instruction in the next column over. This space is the first of thirteen spaces that are available for your labelname. "Spritepointer" happens to have the maximum number of letters that you are allowed. After typing it in, cursor down below the menu and hit the English pound key. It causes everything on the menu area of the screen to be recopied into the menu data area, and from now on when you hit the RETURN key you will see "Spritepointer" on the menu. In addition, whenever you hit f7 followed by the letter corresponding with "Spritepointer" 's row, "Spritepointer" will print out.

Lazy Source Code has most of the other features of *LazyBASIC*, including automatic line numbers which are turned on by answering the question that appears when f6 is accessed followed by answering the question that appears when f8 is accessed and then hitting RETURN twice. For those of you who missed out on *LazyBASIC*, those questions are "JUMP between lines (1-255)", and "What's your line#". You turn off auto line#'s by hitting RETURN on a line which only has a line number on it.

F2 and f4 still toggle the screen and border colors as they did in *LazyBASIC*, and hitting the wrong key still gets you a message "You hit the wrong key—try again!!" Turning off the program is still accomplished by the morbid "Die!!" choice of f7 followed by Q.

My aversion to the shift key lingers in this program with the inclusion of "#" and "$" under f7. These frequently used symbols in assembly programming seem slightly easier in two strokes than they do with a held-down shift key and a stretched finger.

I hope this program helps make the world of machine language as easy and as fun for you as BASIC. □

SEE PROGRAM LISTING ON PAGE 136

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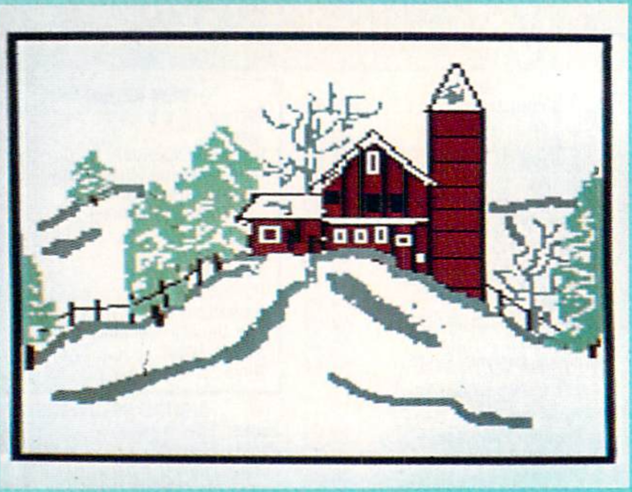
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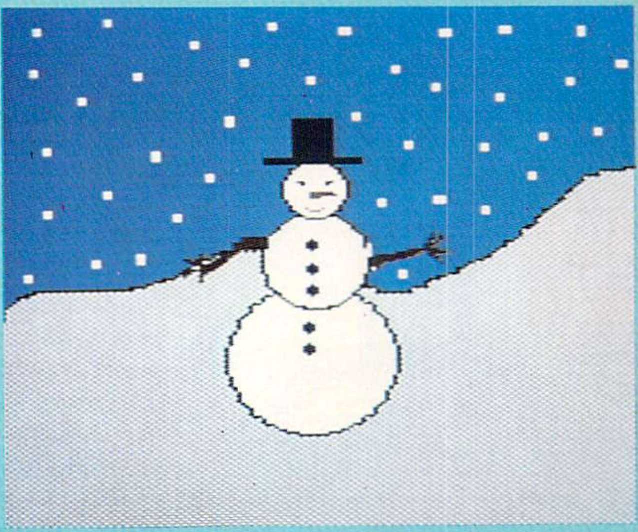






By gosh, by golly—though it's still September as we send this issue to press, this holiday installment of the *Art Gallery* has us looking up the chimney. At top left is *Barn* by Marcy Willbrandt (Battle Creek, MI), drawn with Koala. Only the stockings hung with care are missing from *Fireplace* at top right by Daryl Maksymec (Regina, Massachusetts), also on Koala. Fully accoutred, however, is the fireplace and tree in Marcy Willbrandt's *Christmas* in the middle row. Beside it is *Santa* by Michael Mikottis (Berwyn, IL), done on Koala. Parting with tradition, though, a mouse is stirring in *Christmas Tree* by Sandy Steele (Rockford, IL) at bottom left, done on *DOODLE!* Finishing up are three Koala images by Pamela and Richard Winters (Shreveport, LA): *Sleigh*, *Happy New Year*, and *Frosty*.





BUILD A FIVE VOLT PERIPHERAL POWER SUPPLY

By Morton Kevelson

With the exception of the joystick, every Commodore peripheral requires a source of electrical power. Major peripherals, such as disk drives and printers, will invariably contain their own power supplies. Minor peripherals, in particular printer interfaces, form a symbiotic relationship with the host computer. That is, the power is drawn from the computer's power supply via one of the peripheral ports.

With regard to most printer interfaces, the five volt DC supply is obtained from the computer's cassette port. In this case a single wire from the interface is terminated in a six pin edge card connector which mates with the cassette port. A small printed circuit board is attached to this connector to extend the cassette port so that the tape deck may still be used.

While this hookup does work, we have always viewed it as a workable solution to an intractable problem. The extension board projects beyond the computer's case, where it is subject to contact with stray objects. If you double up peripherals, such as *Serial Box* (reviewed last month) used with a printer interface, we end up with an awkward pairing of two of these extension boards. We have also found that excessive movement of the connecting wire invariably causes it to break. Of course, users of the SX-64 and Plus/4 computers lack the appropriate cassette port entirely.

Some interfaces, Micro R & D's MW-350 in particular, have opted for a joystick port connection to obtain their five volt stimulation. The problem with this arrangement is the tenuous hold the joystick connector has on the port. The real estate to the right of our computer is invariably occupied by pads, pencils, disks, manuals, and other paraphernalia. These are always being moved about, especially during those intervals of printer activity. Somehow the joystick port connector always attracts a glancing blow with disastrous consequences. Aside from all this, our Plus/4, with its peculiar joystick and cassette connectors, is still out of luck.

On top of all this we have encountered an overriding consideration beside which all of the above pales by comparison. We have found that the Commodore 64 power supplies are a finicky lot. In spite of claims to the contrary, the C-64 power pack has little tolerance for external electrical loads. This supply provides two voltages for the computer's use. The critical one is the five volt source. Although the computer requires less than half of the supply's rated output, we have found that the slightest extra current drain causes the built-in voltage regulator to shut down. Symptoms of this activity are a breaking up of the video display, along with a total lack of

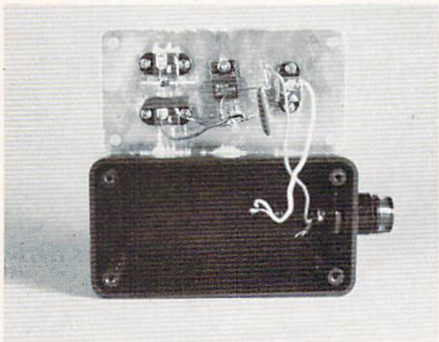


FIGURE 1

The completed peripheral power supply. The center screw mounts the 7805 voltage regulator IC.

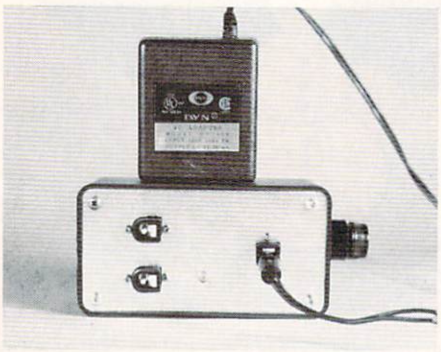


FIGURE 2

View of the inside of the peripheral power supply. The fuse holder is mounted to the side of the case.

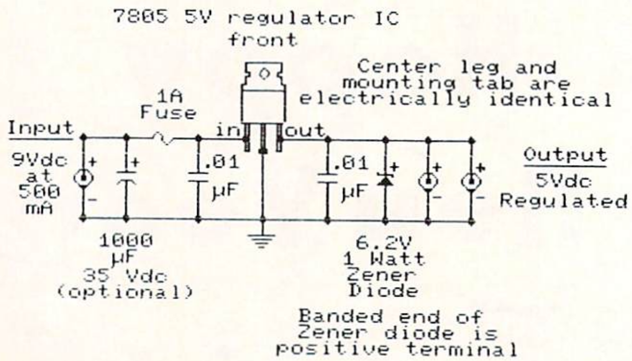


FIGURE 3
Schematic of the five volt DC peripheral power supply.

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Reviewers and users have heaped the following praise on the **BLITZ!**: "The **BLITZ** basic compiler is a dream come true for BASIC programmers." Compute!'s Gazette "worth its weight in gold." TPUG "Wonderful" "Fantastic" "I can't imagine programming without it" User comments. It is even more popular with professional programmers. Many commercial programs now say "**BLITZ!**" when they are listed. The ultimate accolade for **BLITZ!**.

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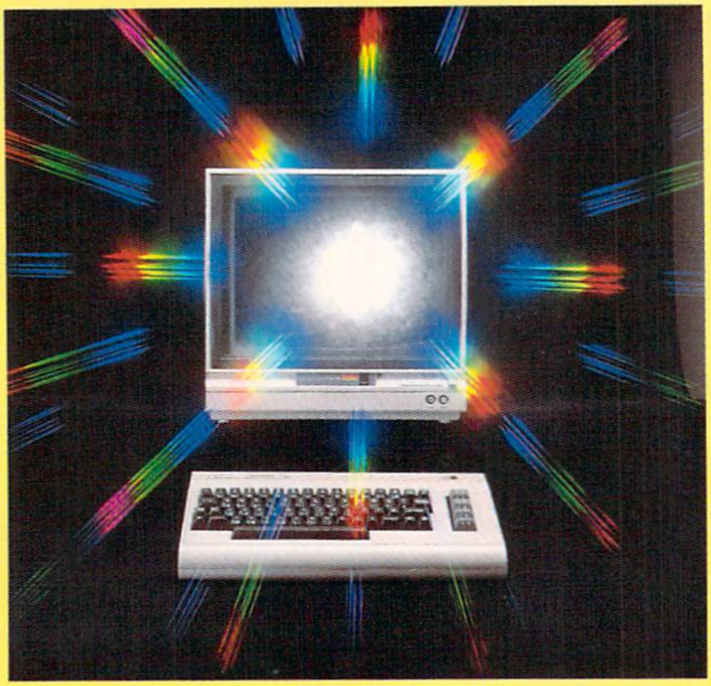
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response from the keyboard. If the external load is disconnected and the power supply is allowed to cool down, normal operation resumes.

The solution to all of the above is to simply provide our peripherals with their own source of power. It turned out to be a simple construction project based on parts available at our local Radio Shack. Before we begin we must present the following:

WARNING!

TO PROPERLY COMPLETE THIS PROJECT YOU WILL REQUIRE BASIC SKILLS IN SOLDERING ELECTRONIC COMPONENTS. ACCESS TO A VOLT/OHMETER AND THE KNOWLEDGE TO USE IT WILL BE HELPFUL FOR THE COMPLETION OF THIS PROJECT. MINOR MODIFICATION OF *SERIAL BOX* AND THE PRINTER INTERFACE WILL BE REQUIRED. THIS WILL VIOLATE THE MANUFACTURER'S WARRANTY. PROCEED AT YOUR OWN RISK.

We hate to seem melodramatic, but such is life.

The project is based on a readily available battery eliminator-style power supply. For our purposes we chose a nine volt unit rated at 500 ma. A milliamp, abbreviated ma, is 1/1000 of an ampere, which is the basic unit of electrical current. The interface requires a regulated source of five volts DC. This is obtained by using a 7805 integrated circuit voltage regulator.

The electrical connections are shown in the accompanying schematic. The remaining components perform various auxiliary functions. The .01 micro Farad capacitors, C1 and C2, decouple the 7805 from the inductance of the connecting leads. The 1000 micro Farad electrolytic capacitor was not used in our prototype. It is required only if the battery eliminator lacks its own filter capacitor. Virtually all general purpose units are so equipped.

The 6.2 volt zener diode serves as a surge protector. It should also cause the fuse to blow in the unlikely event of the complete failure of the 7805. The 7805 voltage regulator has built-in protection against external short circuits and thermal overload of the chip.

The entire project is built into a small utility box. The metal cover of the box also serves as a heat sink for the 7805. A small dab of thermally conductive silicon compound should be applied to the 7805's mounting tab against the box cover. We chose the DC coaxial connectors as they do not short circuit when the plugs are inserted or removed.

Your printer interface will have to be slightly modified to access the ground connection. The positive five volt hookup should be made to the existing wire which goes to the cassette port connector. The ground connection can be traced off pin 2 on the six pin serial bus DIN plug. The pin layout for this plug is shown on page 142 of the *Commodore 64 User's Guide* or page 350 of the *Commodore 128 System Guide*. Just remember that the view shown in the manual is looking from the back at the port in the computer. The actual peripheral connector plug will be a mirror image. Once you have found the correct wire, just solder on the ground lead to a convenient point in the interface.

Interface Current Requirements

Interface	Current
Serial Box	95
Xetec Supergraphix	70
Xetec Graphix Jr.	65
Xetec GPI (obsolete)	250
Micro R & D MW-350 with 10K	190
Cardco ?/A	250
Cardco G-Wiz	90
Cardco Super G	180
Tymac Connection	250

All values are approximate at rated five volts DC. Specific values may vary from sample to sample.

Power Supply Parts List

Item	Radio Shack Stock No.	Description
Battery Eliminator	273-1651	120 Vac to 9Vdc, 500 ma
C1, C2	272-131	.01 uF Capacitor
C3	272-1019	1000 uF, 35 volt, electrolytic capacitor (optional; see text)
J1, J2, J3	274-1565	Coaxial DC jack
P1, P2	274-1567	Coaxial DC plug
(See Description)	270-231	4"×2⅛"×1⅝" utility box
VR	276-1770	7805, 5 volt regulator IC
D1	276-561	1N4735, 6.2 volt, 1 watt zener diode
(See Description)	276-1732	Heat sink grease
(See Description)	270-362	Fuse Holder (5 × 20 mm)
F1	270-1250	1 amp fuse (5 × 20 mm)

Power requirements for interfaces vary. The table above shows the current draw, at five volts DC, for several interfaces we have looked at. The power supply presented here should be able to deliver five volts at 500 ma. This should be enough to drive any two of these peripherals. □

REBELS AND LORDS

For the C-64

By Terry Bryner

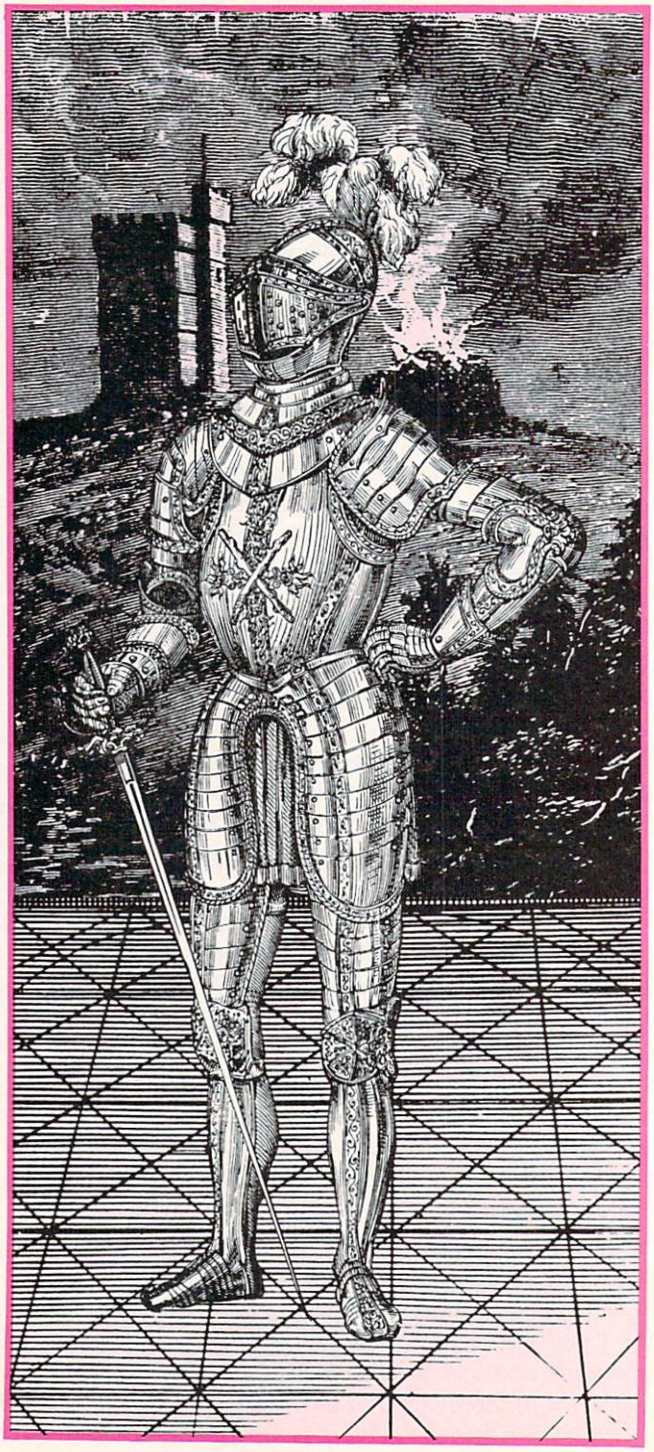
The peasants have rebelled, and the King has made you Lord of a castle, charged with subduing them! In this graphic wargame, you (and up to three other players) pit your armies against the wild rebels on the graphic map to win back the castles for the King. Three levels of difficulty are provided, and even the solitaire game can be challenging.

When you run the game, there will be a delay while the program initializes itself. Then you will be asked to specify the number of Lords (players), the number of castles, and the type of terrain. The program will then generate a map for this game. Most of it will be grassy fields, with castles placed randomly around. The red castle is the first Lord's, the yellow the second's, etc., while the rebel hordes own the black ones. Trees (which hide armies) and rocks (impassable) are also shown. If the first map is unacceptable, reject it and another will be generated.

The game is run in weeks: each Lord issues his armies movement orders, and then all armies move and attack. Follow the prompts, and a square window will appear on the map, and the contents will be displayed below the board. The window can be moved around with the joystick or cursor keys (interchangeable; use f7 for the fire button), to get more information. For your castles you will see the troops inside, and also the 'levy'–the number of additional troops you will receive here each week as long as you hold this castle. You may also see some armies listed below–an identification number and a troop strength (they already have orders to go elsewhere). Non-castle squares may also contain armies; the ones listed at the bottom with an identification number already have orders, while idle troops will be counted above. (Note that information is only available for your own forces; you will not even be told if enemies are hiding in the trees.)

To send unoccupied armies somewhere, press the fire button, use the joystick to set the size, and press the fire button/f7 again. A destination cross will appear: Move this with the joystick/cursor keys to the destination and press the fire button, and the army has its orders!

A word about the troops. They are typical peasants: loyal to their leader, furious fighters, but not overly skilled at marching. They only march five squares a week, and cannot be recalled. In order to move to the southeast,



Ahoy! STILL #1

Ahoy!
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★★★★
Monthly for C64/C128, and considering Amiga coverage. Ahoy! offers type-in programs in BASIC, so you can actually learn from them, articles that are informative and even challenging, and reviews that are somewhat cautious, but sometimes critical. Dale Rupert, Morton Kevelson, and others on the Ahoy! staff are real experts. The best of the 'big three,' with more 'hacker flavor' than the others. (—B.D.)

Everyone respects *INFO* Magazine as the independent observer of the Commodore marketplace. So we were especially proud when *INFO's* September-October '85 product roundup awarded *Ahoy!* a **– rating: the highest given any Commodore magazine. The only fault publisher Benn Dunnington found with *Ahoy!* was that it "seems to fluctuate from issue to issue."**

We promised to stop—and apparently we have, because the August/September '86 *INFO* awarded us four stars—the highest rating of any Commodore monthly!

***INFO's* review of *Ahoy!* is printed here in its entirety, along with those of the three other major Commodore publications. One has retained its previous rating, and two have lost points—while *Ahoy!* moves ahead!**

Compute!'s Gazette
$2.95 Compute Publications
★★★
Slick monthly publication with coverage of Commodore's 64, 128, and some on the Amiga. Emphasis is on type-in games and occasional utilities. Reviews are generally candy-coated but reasonably current. Goes with the flow, avoiding controversy and originality. Both the quality and the accuracy of the type-in programs has been way down lately. (—B.D.)

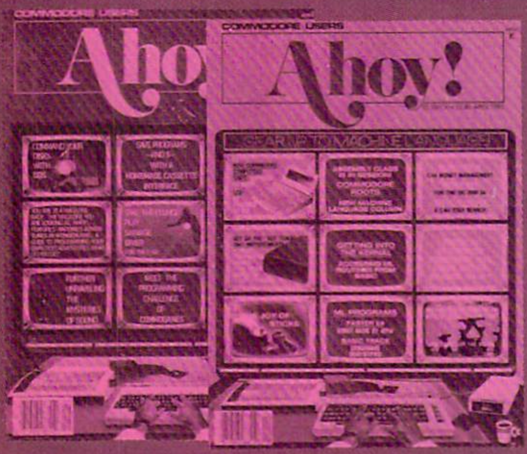
Commodore Microcomputers
$2.50 Commodore Publications
★★★+
Recently merged with 'Power Play,' this is Commodore's own magazine. Some good informative articles, type-in programs in BASIC (so you can learn something), candy-coated 'reviews' that read like press releases, and good photos. Don't expect to read any criticism of Commodore from this gang: their paychecks are still signed in West Chester, PA. Monthly. (—B.D.)

RUN
$2.95 CW Communications
★★★+
This slick monthly Commodore magazine is chock-full of ads, lots of color and photos, occasional decent articles. Reviews are often out of date and, worse, not to be trusted. Though they've toned it down somewhat lately, they are still treating the Plus/4 seriously. Best features are the MAGIC column, which is best obtained in its indexed, all-in-one-place form in the annual *RUN* Special, and Strasma's C= Clinic. (—B.D.)

Back Issues

SPECIAL ANNOUNCEMENT!

A small cache of *Ahoy! #2* (Feb. '84) has been uncovered, and is available at $10 per copy while limited supplies last.



SORRY... ISSUES #1, 2, AND 4 SOLD OUT!

ISSUE #3—MAR. '84 $4.00
Anatomy of the 64! Printer interfacing for VIC & 64! Educational software series begins! And ready to enter: Address Book! Space Lanes! Random Files on the 64! Dynamic Power!

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Game programming column begins! Program generators! Rupert on inputting! Memory management continues! And ready to enter: Post Time for the 64 & VIC! Alpiner! Sound Concept!

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MSD dual disk drive! Database buyer's guide! Training your cursor! Screen displays! File Sleuth! Users Groups! And ready to enter: Renumbering! Checklist! Math Defender! Brisk!

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Program your own text adventure! Build a C-64 cassette interface! Video RAM! And ready to enter: Salvage Diver! DOS! Sound Explorer! The Castle of Darkness! Base Conversions!

ISSUE #10—OCT. '84 $4.00
C-64 graphics programs! Bit-mapped graphics! Joystick programming! And ready to enter: VIC 40 Column Operating System! BAM Read & Print! Emerald Elephant! Lawn Job!

ISSUE #11—NOV. '84 $4.00
Music programs & keyboards for the 64! Graphics feature continues! And ready to enter: PTE word processor! Block Editor! Alternate Character Set for the 64! The Tunnel of Tomachon!

ISSUE #12—DEC. '84 $4.00
Buyer's guide to printers! 1525 printer tutorial! Custom characters! User Guide to KMMM Pascal! Diving into BASIC! And ready to enter: Construction Co.! Space Patrol! Cross Ref!

ISSUE #13—JAN. '85 $4.00
VIC/64 OS exposed! Sprites! 1541 device # disconnect switch! Ghostbusters! And ready to enter: Ultra Mail! Music Tutor! Alice in Adventureland! Midprint! To the Top! Tape/Disk Transfer!

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Making multiscreen gameboards! Inside the Plus/4! Commodore DOS! And ready to enter: Old Routine! Programmable Functions! Automatic Line Nos.! Home Budget! Salmon Run!

ISSUE #16—APR. '85 $4.00
Assembly language column begins! Programming the joystick! 1541 disk drive alternatives! And ready to enter: Hop Around! Faster 64! Booter! Elecheck! BASIC Trace! Space Hunt!

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Disk drive enhancements! Install a reset switch! Assembler escapades! And ready to enter: Super Duper! Two-Column Directory! DSKDU! Raid! DOS Plus! Font Editor! Tile Time!

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PROM programming! 3-part harmonies on VIC/64! Speeding pixels! And ready to enter: Auto-Append! Script Analysis! Wizard of Im! Lucky Lottery! Brainframe! Etch! Printat!

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they may march due south, then due east, or east then south, or even alternate—but they'll get there, unless they run into a rock (they'll stop and tell you). They attack anything not loyal to you, and may even capture a few castles on the way to their destination. When an army meets another (or a castle) you will see the starting strengths, and watch the numbers dwindle as they slug it out.

When a player has ordered all his armies, he hits the Commodore key and the next player directs his armies. Then the armies all move and fight. When all armies have moved five times, the Lords again direct their troops (including new levies that appeared in the castles you hold). A player may also drop out of the game, or all may quit. Each castle starts with a few troops. Yours will have a goodly number, but some of the rebel strongholds may be significant. The strongest ones will occasionally send out armies of their own—which weakens that castle's defense, but those marauding rebels may take back your castles, too. Your task, of course, is to take all the castles on the board.

This is a challenging and unpredictable game. Not only is the initial setup of castles, levies, and troops random, but the result of any battle is also. The defender always attacks first, and he may be much more effective than the attacker, so use lots of troops...if you have them.

I hope you enjoy this game as much as I do, either solitaire or in competition. If you have any questions, please write me at 247 Savannah Round, Summerville, SC 29483.

TECHNICAL NOTES

This program is interesting in a couple of areas. It is basically a game of having more armies in the right place than the "other guy," and taking control of the castles to get more armies. The display is the heart of the game. The board is made of custom characters read in from data statements (Lines 2890-2910; switched in 2970-2980; board printed 230-310). Sprites for the window, cross, and battle are also read in. Messages may be printed at the top by prefacing with H$ or at the bottom of the board with D$. The choice of joystick or keyboard is easy with lines 90-130: JF is non-zero if the fire button/f7 is hit, and JD contains direction. Lines 140-160 position sprite SN at row R, column C. This makes it easy to "roam" the board, looking at the territory (the information for an area is printed out by lines 770-1010). The board is too big for all the information to be printed, so this roaming window idea was used for information, and also for sending armies, rather than the usual "row, column" format. Most of the rest of the programming is, alas, bookkeeping! ☐ *SEE PROGRAM LISTING ON PAGE 139*



Reader Service No. 245

CADET'S COLUMN

Christmas Presents for You and Your Commodore

By Cheryl Peterson

December is usually the best month of the year for home computer sales, and I'm sure 1986 will continue the tradition. For me, that means a whole crop of beginning computer users. Some of our newcomers will be using the new C-64C. While I don't have one of the new machines, Commodore claims it is completely compatible with the old C-64, so this column should be useful to our new computing friends.

I am a bit concerned by Commodore's offering *GEOS* with the C-64C. While it will help new users get comfortable with the computer, I hope that those who use *GEOS* won't think they're limited to it. Those who struggled through learning about their computers can testify to the myriad tasks a computer can perform. *GEOS* touches only two of them.



The most difficult part of using a computer is learning that you can't hurt it (short of dropping it several feet to the floor). You may confuse and confound it by typing strange things on the keyboard, but you can't break it that way. Once you get that firmly entrenched in your mind, the computer becomes a vast new territory to be explored. A program like *GEOS* can help overcome the initial fear.

While *GEOS* does open the door, remember that it only leads into one room of the house. There is much more hidden underneath those icons and menus that won't be found until you find your way out of *GEOS*.

For those just buying their first computer, I would recommend getting a collection of *Ahoy!* back issues. You will find valuable programs to type in, programming hints, lessons on how a computer works, software reviews, and inside looks at the innards of these beasts. The articles can get a little technical, but most can be read and understood even by novice computerists.

There are a few other very good magazines. I highly recommend *INFO* magazine for its reviews and other product information. Another publication, *Transactor*, tends to be more technical and focuses on programming techniques and hints.

A valuable resource for anyone who is considering expanding his computer system is *Computer Shopper*. This "want ads" for the computer world includes many bargains and also carries articles on software, hardware, and applications of computer technology. They recently started a column on CP/M for the Commodore 128 and regularly run articles devoted to the C-64, C-128, and Amiga.

CHRISTMAS PRESENTS

For those who already have a computer, Christmas is a great time to expand your system. After all, the computer's a member of the family too.

One difficult decision is whether to expand the present system or upgrade to a new one. I can offer one bit of advice. If you have a computer that doesn't have a printer, a disk drive, and a modem hitched up to it, you are better off buying these items than getting a new computer. If you upgrade to a machine with more memory, higher screen resolution, etc., you will still have limited capability.

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Disk 1541	Microline
Doodle	Quick Brown Fox
Easy Script	Simon's Basic
Fleet System II	Sky Travel
Flight Simulator II	Speedscript
For the Beginner	Sprites Only
Hes Writer	Superbase 64
Logo Sheet 1	Terminals
Logo Sheet 2	Smart64
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A computer without a disk drive is like a car running on two cylinders. It'll get you there—eventually. The wait for programs to load from tape can seem interminable, and most programs aren't even offered on tape anymore.

For those contemplating upgrading from a C-64 to a C-128 in the near future, you might consider buying a 1571 disk drive instead of a 1541. The 1571 will work with the C-64, and you won't need to upgrade your drive later.

After buying my initial computer system (computer, monitor, and disk drives), the first peripheral I added was a printer. At that time, a printer that could provide graphics and near letter quality print cost $1500. I've never regretted that purchase. Admittedly, the majority of you aren't writers. But now you can buy the same printer for less than $400.

Having such a printer will let you print out letters, labels for addressing your Christmas cards (but then you've done that already this year, haven't you?), database information (reports of your household items for insurance forms, for instance), school reports and papers, and drawings created with graphics packages. If you do your taxes by computer, some programs will even print your IRS forms.

If you decide to go for a printer neither manufactured by Commodore nor designed to be Commodore-compatible, you'll need to buy a printer interface as well. A number of companies market these. One, Cardco, recently went bankrupt, so think twice about buying any of their interfaces unless you can get a very good price on it.

While these first two add-ons (disk drives and printers) seem obvious to many, the wonders of adding a modem to your computer almost have to be experienced to be appreciated. The simple explanation that attaching a modem to your computer and a phone line will let you communicate with other computers just doesn't convey the extent to what you can do with it.

Telecommunicating can put you in touch with hundreds of other users who can offer tips and advice on getting more from your computer. By signing up with a commercial system like PlayNET, QuantumLink, or CompuServe, you can type messages on your keyboard that will be seen by a dozen or more people all over the country almost instantly. You can make friends and play games with other people without leaving your own home. In most large cities it only takes a local telephone call to get online.

Public domain programs can be transferred to your computer through a modem, allowing you to do many tasks more easily. These programs can be found in special sections of the commercial services or on local BBS's (Bulletin Board Systems). If you can find a copy of *Computer Shopper*, they run an updated listing of such BBS's in each issue. The numbers are listed by area code, making it easy to find those that are near you.

Another good buy for Christmas is a starter kit or registration for one of the online services. Most have a toll-free number you can call to sign up if you have a major credit card (MasterCard, Visa, and sometimes American Express). The sign-up charges vary for each service. In some cases, you can buy a starter kit at computer stores.

Each system has a schedule of charges for different services. In some cases, the speed of your modem determines the rate. Some charge extra for 1200 baud. While PlayNET costs less than $3 an hour, CompuServe, The Source, Delphi, and GEnie run $5 to $8.40 an hour at 300 baud during non-prime time hours. Prime time on these services is generally Mon-Fri 8 a.m. to 5 p.m., local time. The charges during prime time are usually twice that of non-prime, if the service is available during the day.

OTHER PERIPHERALS

Some alternate input devices make nice presents for your computer. A new joystick or two can add a lot more fun for the whole family. Since the Commodore 1350 mouse will work with both the C-64 and the C-128, it's another good choice. Some mailorder houses sell the mouse for as little as $39.

Koala Pads are quite inexpensive these days. With one of these and the right graphics software, you can draw pictures on the pad using a stylus. There are even a few children's games that have overlays for the Koala Pad. Other drawing tablets are also readily available.

Another input device that can be fun to use is the light

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pen. Like the drawing pads, they are mostly used for drawing pictures. Special software is usually required, but frequently a drawing program is sold with the light pen.

PROTECTING YOUR BEST FRIEND

Several companies offer power strips or power filtering devices that will help protect your computer from electric surges and glitches. I use a MasterPiece Plus, which is a swivel base that sits under the monitor. The back panel has AC power connectors into which you plug the computer, monitor, printer, and two auxiliary items. I use the two extras for my modem and disk drive. The MasterPiece Plus then plugs into the wall. A master switch on the front panel is used to turn everything on. There are also five switches that make it easy to turn off any of the five items. For instance, if I'm not using the printer or modem, I can disable them by pressing their switch.

The MasterPiece Plus also has a telephone line filter. You plug the phone line into the unit and then run another line to your modem. If you get a power surge down the phone line, this should protect your modem.

If you live in an area where thunderstorms and power surges are a problem, this $150 add-on could save you from some expensive repairs. While it won't protect you against a direct lightning strike to your power pole, it will handle most surges. Ordinary filtering or surge-protecting power strips run as little as $30.

SOFTWARE

There are so many good software packages out there, it is hard to list them all. Rather than slight anyone, I would recommend checking reviews in back issues of *Ahoy!* to find the ones that are really outstanding.

As long as you're picking presents for the computer, don't forget to pick up something fun for yourself. *Ahoy!'s* entertainment software section covers many enjoyable and exciting games. Besides shoot-em-ups aimed at space-happy teenagers, there are strategy and simulation packages that challenge intellect as well as reflexes. Text adventure games can be extremely devious.

CARTRIDGE PRODUCTS

Anyone using a Commodore disk drive should consider getting one of the cartridge products that increase the speed of disk loads and saves. Epyx's *Fast Load* and Access Software's *Mach 5* make the drive work up to five times faster. Since the Commodore's disk drives are notoriously slow, this is one of the best Christmas presents you can get.

Access also markets the *Mach 128* cartridge. While it is designed to work with a C-128 and 1571 drive, a switch on the cartridge's top makes it compatible with

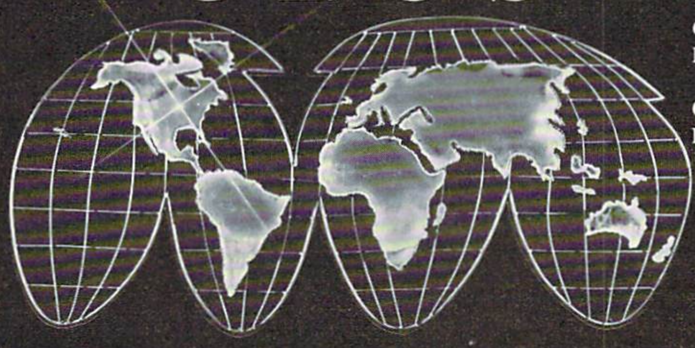
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the C-64 and 1541. If you plan to upgrade to a C-128 someday, it makes sense to buy the slightly more expensive *Mach 128* cartridge.

Timeworks' recently announced *Partner 128* cartridge (reviewed last month) looks like a great collection of frequently needed utilities. It includes a quick loading routine, but also offers a memo pad, appointment calendar, telephone and address book, text-only screen printer, and an address label printer that can use the address book's entries. All of these reside on the cartridge and are supposed to be accessible from inside most C-128 programs. Timeworks has plans to release a C-64 version, but it wasn't ready at press time. It is scheduled to reach stores in November, so you should be able to try one out for Christmas.

Online Services

CompuServe
Starter Kit: $39.95
5000 Arlington Centre Blvd.
P.O. Box 20212
Columbus, OH 43220
Phone: 800-848-8199 (in OH: 614-457-0802)

Delphi
Starter Kit: $49.95
3 Blackstone St.
Cambridge, MA 02139
Phone: 800-544-4005
(in MA: 617-491-3393)

GEnie
Registration Fee: $18
401 North Washington Street
Rockville, MD 20850
Phone: 800-638-9636 ext. 21

PeopleLink
Starter Kit: $10
3215 North Frontage Road, Suite 1505
Arlington Heights, IL 60004
Phone: 800-524-0100

PlayNET
Starter Kit: $15
200 Jordan Road
Troy, NY 12180
Phone: 800-PLAYNET

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CONCLUSION

As you see, there are any number of ways to expand and improve a computer system. You could probably do half your family Christmas shopping at your local computer store. A copy of *Print Shop* and *Hitchhiker's Guide to the Galaxy* for Mom; *Newsroom, Quink, The Little Computer People Discovery Kit, Rescue on Fractulus, Mindwheel, Questron, Music Studio,* and maybe a few modules of *Success With Math* for the children; and for Dad, *Super Bowl Sunday, Flight Simulator II,* and *MultiPlan.* Add a piece or two of hardware, magazine subscriptions, and maybe a couple of books on computer use, and you won't have room for socks, pajamas, and neckties. In all honesty, wouldn't you rather have a few fresh printer ribbons than another necktie? ☐

Reader Service No. 276

TIPS AHOY!

By Michael R. Davila

CAREFREE ANIMATION

The most difficult problem I have encountered while programming games in BASIC is keeping the sound, program logic, and action going simultaneously. To simplify this, I wrote this ML routine that will animate sprite #7 using the three sprite definitions in blocks 13-15.

To use this in your own programs, simply place your sprite data in blocks 13-15, run the machine code loader, and type SYS 679. To vary the speed of the animation, POKE 738 with a number between 3 and 10. The lower the number the faster the animation. (The default value is 10.) Enter and run the example program to see a mythical beast take a carefree stroll.

—Bob Ash
APO, NY

```
10 REM - CAREFREE ANIMATION -
20 V=53248:S=7:GOSUB100
30 POKE53281,0:POKE53280,15:POKE646,11:P
RINT CHR$(147)
40 POKE V+23,(2^S):POKEV+29,(2^S)
50 POKEV+39+S,7:POKE V+(S*2+1),150
60 POKE V+21,PEEK(V+21) OR (2^S)
70 FOR I1=255TO50STEP-1:FOR I2=1TO8
80 POKE V+(S*2),I1:NEXTI2:NEXT
90 END
100 REM ** SPRITE DATA LOADER **
110 FOR I1 = 832 TO 1023: READ SP: POKE
I1,SP: NEXT
120 DATA000,000,000,000,000,000,000,096
130 DATA000,001,096,000,003,032,000,003
140 DATA120,000,003,244,000,063,252,000
150 DATA001,096,000,000,113,224,000,127
160 DATA252,000,255,246,000,127,246,000
170 DATA096,227,000,112,097,000,112,112
180 DATA000,096,232,000,192,080,000,096
190 DATA096,000,064,064,000,000,000,000
200 DATA000,000,000,000,000,000,000,096
210 DATA000,000,096,000,001,032,000,003
220 DATA120,000,003,248,000,255,240,000
230 DATA003,096,000,001,113,224,000,127
240 DATA252,000,255,246,000,127,242,000
250 DATA224,230,000,192,098,001,192,112
260 DATA001,064,112,001,032,144,001,096
270 DATA216,001,064,160,000,000,000,001
280 DATA000,000,000,000,000,000,000,096
290 DATA000,001,096,000,003,032,000,003
300 DATA120,000,003,244,000,063,252,000
310 DATA001,096,000,000,113,224,000,127
320 DATA252,000,255,246,000,127,246,000
330 DATA096,227,000,112,097,000,112,112
340 DATA000,096,232,000,192,080,000,096
350 DATA096,000,064,064,000,000,000,000
360 REM *** MC LOADER ***
370 FOR I1 = 679 TO 753: READ MC: POKE I
1,MC: NEXT:SYS 679
380 DATA 169,2,141,54,3,141,53,3,120,169
390 DATA 188,141,20,3,169,2,141,21,3,88
400 DATA 96,238,54,3,173,54,3,201,1,240
410 DATA 12,201,10,144,37,169,0,141,54,3
420 DATA 24,144,29,238,53,3,173,53,3,201
430 DATA 3,208,10,169,0,141,53,3,169,12
440 DATA 141,52,3,238,52,3,173,52,3,141
450 DATA 255,7,76,49,234,0
460 RETURN
```

POKE AND FIND MESSAGES

These two short programs may help when programming in machine language or discovering messages in your machine. It should work on any machine, but I've only tried it on the C-64. The first, *POKE Message,* allows you to type in a message and it will POKE in the ASCII values of the message into the appropriate memory locations. This is useful when you want to put replace a message somewhere in memory. It would be very tedious if you had to POKE each individual character.

The second program, *Find Message*, will try to find a message in memory that is between the starting and ending addresses which you specify. It will tell you if it is not found. You could look for BASIC keywords or error messages in memory, or look for other messages. If you look for a BASIC message, the start address would be 40960 and the end address would be 49152. When you type in the message, capitalize the last letter. For example, if you were looking for 'NEXT', type: nexT. This is how BASIC knows where the end of a message is.

In both programs, when you input the numbers, input them in decimal. If you want to use special characters when typing in the message (such as CLR/HOME or color keys), type a quote mark before you enter the message.

—John Chong
Syracuse, NY

POKE MESSAGES

```
0 REM POKE MESSAGES
1 INPUT"ADDRESS: ";A:INPUT"MESSAGE: ";B$
:L=LEN(B$)
2 FORI=1TOL:POKEA-1+I,ASC(MID$(B$,I,1)):
NEXT
3 PRINT"MESSAGE RESIDES FROM"A"-"A - 1+L
:PRINT"AND IS "L"CHHARACTERS LONG"
```

FIND MESSAGES

```
0 REM FIND MESSAGE
1 INPUT"START";S:INPUT"END";E:INPUT"STRI
NG TO SEARCH FOR";X$:L=LEN(X$)
```

```
2 FORI=1TOL:IFPEEK(S-1+I)=ASC(MID$(X$,I,
1))THEN NEXT:PRINTX$,S,S+L:END
3 I=L:NEXT:S=S+1:IFS=ETHENPRINT"NOT FOUN
D":END
4 GOTO 2
```

ONE MORE FUNCTION KEY!

Okay folks, hold your breath on this one. I am a two-drive programmer who flicks disks in and out like an epileptic centipede–and I get tired of typing "CATALOG D0,U9" every time I want to see a directory of drive 9.

The problem is that the currently defined function keys are so well chosen for their initial bootup contents that it is a shame to have to redefine one.

Wa-lah! A quick look at Jim Butterfield's memory maps shows the HELP key has a five byte ASCII buffer of its own! Since I hardly ever need the HELP command, I figured out a bare bones, no frills abbreviated CATALOG call to device 9 that just squeezes in with a carriage return. Once this commnd is in the buffer, it is impervious to RUN STOP/RESTORE!

In the program listing are a few other useful definitions, depending on your preference. Each one is all on one line number by itself, so load in the program when you boot up your 128, list the program on the screen, and type NEW.

Then cursor up to the line number of the command you want to define, hit return (so the line is the only line number in memory, and clear the screen and RUN.

If you need the HELP key for debugging, you can still use the ultra-abbreviated form for the Directory on device 9–"C(SHIFTA)U9"

This tip has been a real convenience to me in using two drives. –Cleve Blakemore
Richmond, VA

```
10 REM REDEFINES THE HELP KEY ON THE C-1
28 TO READ ERROR CHANNEL OFF THE DRIVE
20 FORX=4168 TO 4171:READA$:POKEX,ASC(A$
):NEXT:POKE4172,13:DATA ?,D,S,$
30 REM REDEFINES THE HELP KEY ON THE C-1
28 TO DISPLAY THE DIRECTORY ON DRIVE 9
40 FORX=4168 TO 4171:READA$:POKEX,ASC(A$
):NEXT:POKE4172,13:DATA C,"[SHIFT A]",U,
9
50 REM REDEFINES THE HELP KEY ON THE C-1
28 TO GOTO C-64  MODE
60 FORX=4168 TO 4171:READA$:POKEX,ASC(A$
):NEXT:POKE4172,13:DATA G,O,6,4
70 REM REDIFINES THE HELP KEY ON THE C-1
28 TO ENABLE PROGRAM TRACING
80 FORX=4168 TO 4171:READA$:POKEX,ASC(A$
):NEXT:POKE4172,13:DATA T,R,O,N
```

HIGH RESOLUTION ML ASSISTANCE

When using high-resolution graphics on the Commodore 64, a total of 9000 bytes of memory locations must be POKEd. It is very time consuming to POKE each individual location using BASIC. The following ML routine using a BASIC program loader would be faster and more practical to handle this tedious job. The routine will set up a high resolution screen and change the background and border colors to black when you type "SYS 49152". To change the border color, you simply change the "0" in line 30 to the POKE code of the color you desire. If you would like to alter the background color, change the second "0" in line 60 to the color POKE code of your choice. By typing "SYS 49241", the screen will clear and revert back to text mode. If you change the "14" or the "6" in line 90 to another POKE code, the screen background or border in text mode will produce the corresponding colors, respectively. Be sure to change the correct value of the variable "DT" in line 20 by adding or subtracting the corresponding value of any revised POKE codes or an 'ERROR IN DATA STATEMENTS' message will occur. –Stanley C. Evans
Bahama, NC

```
10 FOR LOC=49152TO49272:READ PKODE:POKE
LOC,PKODE:DT=DT+PKODE:NEXT
20 IF DT<>15710THENPRINT"ERROR IN DATA"
30 DATA 173,24,208,9,8,141,24,208,173,17
,208,9,32,141,17,208,169,0,141,32,208
```




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```
40 DATA 169,0,133,178,169,32,133,179,162
,32,160,0,169,0,145,178,136,208,251
50 DATA 230,179,202,48,2,208,244,162,96,
32,80,192,169,0,133,178,169,4,133,179
60 DATA 162,3,160,0,169,0,145,178,136,20
8,251,230
70 DATA 179,202,48,2,208,244,162,236,160
,0,145,178,200,202,208,250,96
80 DATA 173,24,208,41,247,141,24,208,173
,17,208,41,223,141,17,208
90 DATA 169,14,141,32,208,169,6,141,33,2
08:REM SET BACKGROUND & BORDER COLORS
100 DATA 169,147,32,210,255,96:REM CLEAR
 SCREEN
```

NO PRINT

Here is a little BASIC utility for the C-128 that enables a programmer to give the user instructions, menu options, or documentation without PRINT or the weird ol' REM. The trick is to turn off the line numbers is Line 20 (POKE24,27), since the 128 doesn't halt the program execution with a LIST command. It's handier than listing REM statements, or running PRINT with data statements. Other 128 features can be used when programming instructions in this style also, such as the escape codes (Delete, Insert, etc.), or functions such as auto line numbering. I've found it handy, especially in longer applications. Combined with the other features of the 128, when programming instructions or documentation, it is reminiscent of a very simple word processor.

–Barri Olson
Madison, WI

```
10 REM NO PRINT/REM DOCUMENTATION//BARRI
 OLSEN//80 COL VER
20 POKE24,37:LIST30-50:POKE24,27:RUN60
30 SEE HOW EASY THIS MAKES CREATING TEXT
 ON THE C-128. A LIST WITHIN
40 A PROGRAM DOESN'T STOP IT. FOR 40 COL
. OR WINDOW USAGE ADJUST SPACING
50 TO SEND TO YOUR PRINTER, OPEN A CHANN
EL AND USE 'CMD' -LIST-LINE# IN LINE 20
60 PRINT"SEE! -AND IT'S HANDY FOR LONG A
PPLICATIONS ":END
```

FAST SIMULATOR

For 64 programmers there exists a method of simulating the 128's FAST mode, at least to a degree. To demonstrate, type in and run the following lines. Remember that there are 60 jiffies to 1 second.

```
10 TI$="000000"
20 FOR T=1TO1000:NEXT
30 PRINT TI$; " JIFFIES"
```

Now add these lines to the program. Do not be alarmed when the screen blanks when you run the program again.

```
5 PRINT"STANDBY...":FORT=1TO500:NEXT
6 POKE 53265,0: POKE 56325,255
25 POKE 53265,27: POKE 56325,46
```

Note that the FOR loop in Line 20 took a shorter time to execute with the added lines. The VIC chip refreshes the screen display 60 times a second. POKE 53265,0 disables the VIC chip, giving the 6510 chip more time to process BASIC. POKE 56325,255 gives the 6510 less time to scan the keyboard and more time to process BASIC. POKE 53265,27 and POKE 56325,46 set things back to normal.

These POKEs would be most helpful in a portion of a program in which the user needs to neither see the screen nor use the keyboard, such as a sort routine or a READ...DATA routine. The program should warn the user about the blank screen before the VIC chip is disabled.

–Mark Bersalona
Philadelphia, PA

PERFECT CIRCLE

For *Ahoy!* readers with C-128's: When using the graphics in hi-res to produce a perfect circle, the proper ratio between the X radius (Xr) and the Y radius (Yr) is 5:4. If Xr is known, Yr can be calculated by Yr=(Xr/5)*4. If Yr is known, Xr can be calculated by Xr=(Yr/4)*5. Some sample commands are "CIRCLE 1,100,90,30,(30/5)*4" or "CIRCLE 1,100,90,(30/4)*5,30".

–Andy Hatchell
Durham, NC

SAVE SCREEN

Did you ever wish to save your game screen directly to disk? If the answer is yes, here is a short utility you'll enjoy. Simply type the line shown below or insert it in your own program.

To LOAD your game screen type LOAD"filename",8,1 and then type POKE 53281,color and your screen will appear.

–Marco Gauthier
Fitch-Bay, Canada

```
SYS 57812"filename",8:POKE 193,0:POKE
194,4:POKE 174,231:POKE 175,7:SYS 62954
```

COMBINER

To combine two or three programs into one larger program, a lot of work is needed. The easier way is to use an append routine. This will save your fingertips from doing unnecessary work.

To append, load the first program into memory. You can list it if you want. Then type (in direct mode):

```
POKE 43,PEEK(45)-2 : POKE 44,PEEK(46)
```

When you try to list it, no program lines are listed, because the computer tries to start at the end of the program.

Then load the second program. You can list it if you want. (Note: The first line number of the second pro-

gram must be larger than the last line number of the first program.) Then type (in direct mode):

```
POKE 43,1 : POKE 44,8
```

When you type LIST and RETURN, you will find that the first and the second program have been appended.

Note: When you get 'OUT OF RANGE ERROR', try to add an unnecessary line in the program such as:

```
0 REM
```

–Adzhar Hamdan
Syracuse, NY

BASIC SCREEN COPIER SUBROUTINE

The following subroutines for the C-128 and C-64 can be used within BASIC programs to copy the screen to a printer. The normally slow and complex task of converting screen codes to ASCII code is speeded up very simply by using the first screen location as an input device. The screen codes from the entire screen are POKEd into the first location in turn and the GET#3 command is used to convert the screen code into its ASCII equivalent. The variable L$ is used to hold a screen line of text, and then it is sent to the printer. The somewhat slow rate of the copy is made up for by how simple and short the routine is. To use within a program, simply print your output to the screen as desired, then set the variable SA to 0 or 7 for UPPER CASE/GRAPHIC or UPPER/LOWER CASE, then call the subroutine and the screen will be sent to the printer (example: SA=0:GOSUB10 or SA=7:GOSUB10). You may of course change the line numbers to fit your own program. –Ernest R. Hunter
Long Beach, MS

C-128 VERSION

```
10 B=1024:A=PEEK(B):OPEN3,3:OPEN4,4,SA:F
AST:FORJ=0TO24:REM"FOR THE C-128"
20 L$="":FORI=0TO39:POKEB,PEEK(B+J*40+I)
:POKE244,0:PRINT"[HOME]";:GET#3,A$
30 L$=L$+A$:NEXT:PRINT#4,L$:NEXT:POKEB,A
:PRINT#4:CLOSE4:CLOSE3:SLOW:RETURN
```

C-64 VERSION

```
10 B=1024:A=PEEK(B):OPEN3,3:OPEN4,4,SA:F
ORJ=0TO24:REM"FOR THE C-64"
20 L$="":FORI=0TO39:POKEB,PEEK(B+J*40+I)
:POKE212,0:PRINT"[HOME]";:GET#3,A$
30 L$=L$+A$:NEXT:PRINT#4,L$:NEXT:POKEB,A
:PRINT#4:CLOSE4:CLOSE3:RETURN
```

1571 SINGLE SIDED MODE

If your commercial software worked with your 128/1541 system and won't with an upgraded 128/1571 configuration, try changing the 1571 disk drive to single sided mode. This can be done in direct mode, before loading, or added as a line in the BASIC loader used by most store-bought software. The loader is almost always the first program on a commercial disk. The following command accomplishes this. The drive must be on.

–Edward Horgan
Coatesville, PA

```
OPEN15,8,15: PRINT#15,"U0>M0":CLOSE15
```

OUTER SPACE WITH JUST FOUR LINES

This four line program shows how powerful the C-128 BASIC 7.0 graphic and sprite commands are. The program draws a universe complete with planets orbiting around a sun along with stars and shooting asteroids. It even adds a bit of space sound. It would require many BASIC lines to do this on the C-64, and you would probably have to resort to machine language to get the speed. You can study the four very simple lines for ideas for forming screens for games or other programs requiring graphics, sound, and animation. –Ernest R. Hunter
Long Beach, MS

```
10 COLOR4,1:COLOR1,8:COLOR0,1:GRAPHIC1,1
:FORJ=0TO90 STEP 30:CIRCLE1,25,22,0,8,,,
J:NEXT:SSHAPEA$,11,10,34,31:SPRSAVA$,7:S
PRSAV7,8:GRAPHIC1,1:MOVSPR7,260 #9
20 MOVSPR8,145 #12:SPRITE7,1,6:SPRITE8,1
,9:GRAPHIC1,1:CIRCLE1,25,22,6,6:PAINT1,2
6,26:SSHAPEB$,11,10,34,31:GRAPHIC1,1:FOR
J=1TO100:H=RND(0)*(35):V=RND(0)*24
30 CHAR0,H,V,".   .":NEXT:CIRCLE1,150,10
0,10,10:PAINT1,151,101:FORJ=1TO6:SPRSAVB
$,J:SPRITEJ,1,J+3,1:MOVSPRJ,160+J*20,140
:CIRCLE1,150,100,J*20,J*20:NEXT
40 VOL8:SOUND1,55535,250,0,42768,1000,2,
2600:FORJ=0TO2*[PI] STEP .5:FORI=1TO6:X=
160+(I*20)*COS(J-I*20):Y=140+(I*20)*SIN(
J-I*20):MOVSPRI,X,Y:NEXT:NEXT:GOTO40
```

INSTANT RUN

Here is a tip that eliminates the need to type RUN. Lines 10 and 20 copy BASIC and Kernal into RAM memory. Line 30 switches the 64 from ROM BASIC to RAM BASIC. Line 40 prevents RAM BASIC from being switched out by RUN STOP/RESTORE. Lines 50 and 60 change the READY. prompt to the word RUN and puts the cursor on the word RUN. To run a program after loading it in, simply hit RETURN. This is especially helpful in debugging programs, where you must run a program several times to check for bugs and to test for corrections. –Mark Bersalona
Philadelphia, PA

```
10 FOR X=40960TO49151:POKEX,PEEK(X):NEXT
20 FOR X=57344TO65535:POKEX,PEEK(X):NEXT
30 POKE1,53:REM SWITCH IN RAM BASIC
40 POKE64982,53:REM PROTECT FROM RESTORE
50 FOR X=41848TO41853:READN:POKEX,N:NEXT
60 DATA 82,85,78,141,145,145
```

COMMODARES
PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

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We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette (1541 format only) are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #36-1: FANCY FACTORIALS

This problem was submitted by Jim Speers (Niles, MI). Write a program to calculate any factorial (up to 1000 factorial). For example, 5! (five factorial) is 5 * 4 * 3 * 2 or 720. Jim's solution calculates factorials exactly, giving all 869 digits of 400 factorial. Both exact and approximate solutions will be considered.

PROBLEM #36-2: ANIMATED EXPANSION

The user enters a word. The computer displays it at the left of the screen and then proceeds to expand the word to the right, accordion fashion, by inserting a specified number of spaces between letters.

For example, if the number of spaces is two, and the word is Ahoy, the sequence looks like this (all on the same screen line):

```
Ahoy
A-hoy
A--hoy
A--h-oy
A--h--oy
A--h--o-y
A--h--o--y
```

where " - " represents the added spaces. No POKEs allowed. Can your solution be easily modified to reverse the process and squeeze the word back together?

PROBLEM #36-3: LIFE TIMES

Here is one from Bill Okerblom (Providence, RI) that should be interesting even for first-time programmers. Write a program which prints out the dates for the previous 100 lifetimes of the user. If the user is 30, the program displays something like this:

```
1) 1956     2) 1926     3) 1896     4) 1866
... 99) 984 BC     100) 1014 BC
```

Bill suggests that it gives a different perspective to see how many of your lifetimes ago (rather than years or centuries) America was discovered or the pyramids were built.

Since the year 1 AD (not 0 AD) followed the year 1 BC, the "BC" years in the example are off by one. You can fix that problem if you want, although one year doesn't really matter here.

PROBLEM #36-4: CROSSED LADDERS

Some of you may recall, as I do, the agony of trying to solve this classic problem algebraically. Does the computer make it any easier? Two tall buildings face each other across a narrow street. A 30 foot ladder goes from the base of building A and leans against building B. A 20 foot ladder goes from the base of building B to the face of building A. The point at which the ladders cross is 6 feet above the ground. How wide is the street? Sounds awfully easy, doesn't it?

We will begin this month with another solution to a problem discussed last month, *#31-4: Repeated Compression.* The problem is to compress a string which contains repeated adjacent characters and to print it without the duplicate letters. For example, "COMMOOODAAA-RRESS" becomes "COMODARES" (with one "M"). This

solution from Sol Katz (Lakewood, CO) is unusual since it uses recursion in a COMAL program to do the job.

```
0001 // COMMODARES PROBLEM #31-4
0002 // REPEATED COMPRESSION
0003 // COMAL SOLUTION BY
0004 // SOL KATZ
0005 //
0010 DIM STRING$ OF 80
0020 PRINT
0030 INPUT "ENTER STRING TO COMPRESS>> "
: STRING$
0040 COMPRESS(1) // START WITH FIRST CHA
     RACTER
0050 // END OF PROGRAM //
0060 // THIS IS THE ROUTINE (PROCEDURE)
0070 //      INVOKED BY LINE 40
0080 PROC COMPRESS(POS)
0090   IF STRING$(POS)<>STRING$(POS-1) TH
EN PRINT STRING$(POS),
0100   IF POS<LEN(STRING$) THEN COMPRESS(
POS+1) //THE RECURSIVE CALL
0110 ENDPROC COMPRESS
```

The main part of the program is line 40 which "calls" the routine beginning at line 80. The COMPRESS procedure calls itself (that's the recursion) in line 100, each time with the value of the argument POS incremented by one. Once POS is equal to the length of the input string, the routine branches to line 110 which essentially returns to line 50 to end the program.

Recursion is not necessarily an efficient or desirable solution. Some readers chastised me for my recursive BASIC permutation program a few months ago, which in fact was many times slower than the more straightforward solutions (not to mention the fact that it quickly ran out of stack space). This solution is presented as an interesting programming technique.

The statement COMPRESS(POS+1) in line 100 looks like it should be equivalent to the BASIC statements POS=POS+1 : GOSUB 80. For all practical purposes in this program they are equivalent. In actuality, the recursive COMAL routine does not change the value of POS. Each invocation of the COMPRESS routine has its own value of POS. This is most easily understood if we add line 105 PRINT POS. In the BASIC equivalent, only one value of POS (the last value) would be printed. In the recursive program, each value assigned to POS (from largest to smallest) will be printed.

This BASIC program behaves the way that the recursive COMAL program behaves:

```
•5 REM -- BASIC RECURSION --
•10 S$="TTEE[3"S"]TT"
•20 N=1 : P(N)=1 : GOSUB 80
•30 END
•80 P=P(N)
•90 IF MID$(S$,P,1)<>MID$(S$,P+1,1) THEN
 PRINT MID$(S$,P,1);
•100 IF P<LEN(S$) THEN N=N+1: P(N)=P+1: G
 OSUB 80
•105 PRINT P(N);
•110 N=N-1 : RETURN
```

Here N keeps track of the level of recursion. P(N) keeps the value of P at each level. P in this program is equivalent to POS in the COMAL version. When P=9, the conditional statement in line 100 is false, and line 105 is executed, printing the value 9. Since level 9 was called from line 100 of level 8, the RETURN in line 110 of level 9 brings the program back to line 105 of level 8 which prints 8, and so forth. Consequently the equivalent of recursion is possible in BASIC, but you must keep track of the levels and the variables at each level since BASIC doesn't do that for you.

Problem #32-1: Diligent Decoder was the counterpart to *Problem #28-4: Elegant Encoder*, both from Jim Speers (Niles, MI). Each letter in a word is encoded by replacing it with a letter whose numeric value equals the sum (modulo 29) of the other letters' values in the word. 29 characters are allowed (@, A-Z, [, and <English pound>). Modulo 29 (MOD 29) means to continuously subtract 29's from the value until it is less than 29. Your task was to decode such an encoded word.

As promised in the August issue, here are the encoder/decoder solutions from Matt Shapiro (Fort Lee, NJ) and from David Hoffner (Brooklyn, NY).

```
•1 REM COMMODARES PROBLEM #32-1:
•2 REM     DILIGENT DECODER
•3 REM SOLUTION BY
•4 REM     MATT SHAPIRO
•5 REM (ALSO #28-4:ELEGANT ENCODER)
•6 REM
•10 DIM W(28):DEF FNM(X)=X-29*INT(X/29)
•20 INPUT"WHAT'S YOUR WORD";W$
•30 PRINT"[RVSON]E[RVSOFF]NCODE OR [RVSON
 ]D[RVSOFF]ECODE?  ";
•40 GET A$:IF A$<"D" OR A$>"E" THEN 40
•50 PRINT A$:L=LEN(W$):S=0:IF L<2 OR L>29
 THEN 20
•60 FOR I=1 TO L:W(I)=ASC(MID$(W$,I,1))-6
 4:S=S+W(I):NEXT:W$="":IF A$="E" THEN100
•70 S=FNM(S)
•80 Q=S/(L-1):IFQ<>INT(Q) THEN S=S+29:GOT
 O 80
•90 S=Q
•100 FOR I=1 TO L:W$=W$+CHR$(FNM(S-W(I))+
 64):NEXT:PRINT W$:END
```

```
•1 REM COMMODARES PROBLEM #32-1:
•2 REM     DILIGENT DECODER
•3 REM SOLUTION BY
•4 REM     DAVID HOFFNER
•5 REM (ALSO #28-4:ELEGANT ENCODER)
•6 REM
```

```
·200 INPUTA$:A=LEN(A$):DIMF(A):FORX=1TOA:
 F(X)=ASC(MID$(A$,X,1))-64:C=C+F(X):NEXT
·210 FORX=1TOA:B=C-F(X):B=INT(29*(B/29-IN
 T(B/29))+64.1):B$=B$+CHR$(B):NEXT
·220 PRINT B$:FORX=1TOA:F(X)=ASC(MID$(B$,
 X,1))-64:D=D+F(X):NEXT:L=A-1
·230 IF D/L>INT(D/L) THEN D=D+29:GOTO 230
·240 FORX=1TOA:G=D/L-F(X):G=INT(29*((G/29
 )-INT(G/29))+.1):PRINTCHR$(G+64);:NEXT
```

David's program inputs the word, then displays the encoded value and then decodes it. Matt's program lets the user specify whether the input word is to be encoded or decoded.

These two solutions are very similar. Matt defines a MOD 29 function in line 10. David uses the INT function in lines 210 and 240 to calculate MOD 29. The added .1 in David's program is a standard technique to guarantee proper truncation by the INT function. The .1 may be needed for certain values of G when the division by 29 cannot be performed precisely enough. (For you super programmers, when is the .1 actually needed? For what values of G in line 240 would the results be different without it?)

Problem #32-2: Text Search from Len Lindsay (Madison, WI) was easily solved with COMAL's IN function, as this program from Bill Davies (Downingtown, PA) shows.

```
0001 //  COMMODARES PROBLEM #32-2
0002 //      TEXT SEARCH
0003 //  COMAL SOLUTION BY
0004 //      BILL DAVIES
0010 DIM SEARCH'STRING$ OF 30
0011 DIM FILE'STRING$ OF 30
0012 INPUT "ENTER SEARCH STRING: ": SEAR
CH'STRING$
0013 OPEN FILE 3,"TESTFILE",READ
0014 REPEAT
0015  INPUT FILE 3: FILE'STRING$
0016  IF SEARCH'STRING$ IN FILE'STRING$
THEN
0017   PRINT FILE'STRING$
0018  ENDIF
0019 UNTIL EOF(3)
0020 CLOSE FILE 3
```

The IN function is true if the search string is found in the target string. The EOF function in line 19 is false until the end-of-file marker is found in the search file.

A solution for the C-64 from Jason Simpson (Everett, WA) is listed below:

```
·1 REM COMMODARES PROBLEM #32-2:
·2 REM       TEXT SEARCH
·3 REM SOLUTION BY
·4 REM      JASON SIMPSON
·5 REM
·10 INPUT"SEARCH STRING";A$
·20 A=LEN(A$)
·30 OPEN1,8,0,"TESTFILE,S,R"
·40 IF ST THEN CLOSE1 : END
·50 INPUT#1,B$
·60 B=LEN(B$)
·70 FOR Y=1 TO B
·80 IF MID$(B$,Y,A)=A$ THEN PRINT B$: Y=B
·90 NEXT Y
·100 GOTO 40
```

This program opens the sequential file "TESTFILE". If the file is not found, ST will be unequal to zero and the program ends in line 40. Otherwise each string (up to the next carriage return) is read into the variable B$. Lines 70 through 90 step through B$ looking for a substring equal to A$. If a match is found, the loop variable Y is set equal to the end value B so that the FOR/NEXT loop will be terminated in line 90. This is neater than using a GOTO to branch past the NEXT Y statement.

Kurt Schaeffer (Lebanon, PA) used a FOR/NEXT loop like this:

```
FOR Y=1 TO LT-LS+1
IF MID$(target$,Y,LS)=search$ THEN CT=CT
+1
NEXT Y
```

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where LT and LS are the lengths of the target (file) string and search string respectively. CT counts the number of times that search$ is found in target$.

The following solution from Louis Dix (North Hampton, NH) takes advantage of several functions in BASIC 7.0 for the C-128:

```
•1 REM COMMODARES PROBLEM #32-2:
•2 REM       TEXT SEARCH
•3 REM C-128  SOLUTION BY
•4 REM     LOUIS DIX
•5 REM
•10 INPUT "ENTER SEARCH SUBSTRING ";S$
•20 DOPEN#3,"TESTFILE"
•30 DO
•40 INPUT#3,L$
•50 IF INSTR(L$,S$) <> 0 THEN PRINT L$
•60 LOOP UNTIL ST
•70 DCLOSE
```

The INSTR function gives a value corresponding to the starting position of the first occurrence of substring S$ within L$. If S$ is not in L$, then INSTR returns a zero. The LOOP UNTIL ST line causes the program to branch back to line 40 if the STatus variable is not zero. ST is zero until the end of the file is found.

Here is the program to create the sequential file called TESTFILE on the disk. It must be run once before the three programs above are used.

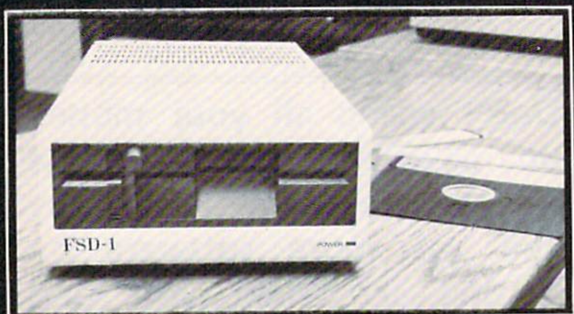
```
•1 REM COMMODARES PROBLEM #32-2:
•2 REM       TEXT SEARCH
•3 REM PROGRAM TO CREATE SEQ FILE
•4 REM       "TESTFILE"
•5 REM
•10 OPEN 8,8,8,"TESTFILE,S,W"
•20 FOR N=1 TO 4
•30 READ L$ : PRINT#8,L$
•40 NEXT N : CLOSE 8 : END
•50 DATA FIRST LINE, SECOND LINE
•60 DATA THIRD LINE, FOURTH LINE
```

Of course you may use these TEXT SEARCH solutions to look through any other sequential files for specified substrings. Change the input filename appropriately. You must modify these programs to use the GET$ function instead of the INPUT# function if you want to search through program files.

Good solutions for *Problem #32-3: Round Robin* came from Douglas Underwood (Walla Walla, WA), Scott Preston (Shillington, PA) in COMAL, and this one from Fred Ransom (Oxnard, CA).

```
•1 REM COMMODARES PROBLEM #32-3:
•2 REM       ROUND ROBIN
•3 REM SOLUTION BY
•4 REM       FRED RANSOM
•5 REM
•10 INPUT "NUMBER OF TEAMS";N
•20 DIM T$(N)
•30 FOR K=0 TO N-1
•40 PRINT"TEAM NUMBER ";K+1;: INPUT T$(K)
•50 NEXT K
•55 IF (N AND 1) THEN N=N+1:T$(N-1)="[3"-
"]"
•60 INPUT "TO (P)RINTER OR (S)CREEN [S]";
FL$
•70 DEV=3 : IF FL$="P" THEN DEV=4
•80 OPEN 4,DEV
•90 FOR J=1 TO N-1
•100 FOR A=1 TO 3 : PRINT#4 : NEXT
•110 PRINT#4,"ROUND ",J
•120 PRINT#4,"HOME", "AWAY"
•130 PRINT#4,"[6"="]", "[6"="]"
•140 FOR K=0 TO (N/2-1)
•150 IF (J AND 1)=1 THEN PRINT#4, T$(K),
T$(K+N/2)
•160 IF (J AND 1)=0 THEN PRINT#4, T$(K +
N/2), T$(K)
•170 NEXT K
•180 A$=T$(1)
•190 IF N < 3 THEN 240
•200 FOR K=2 TO N-1
•210 T$(K-1)=T$(K)
•220 NEXT K
```


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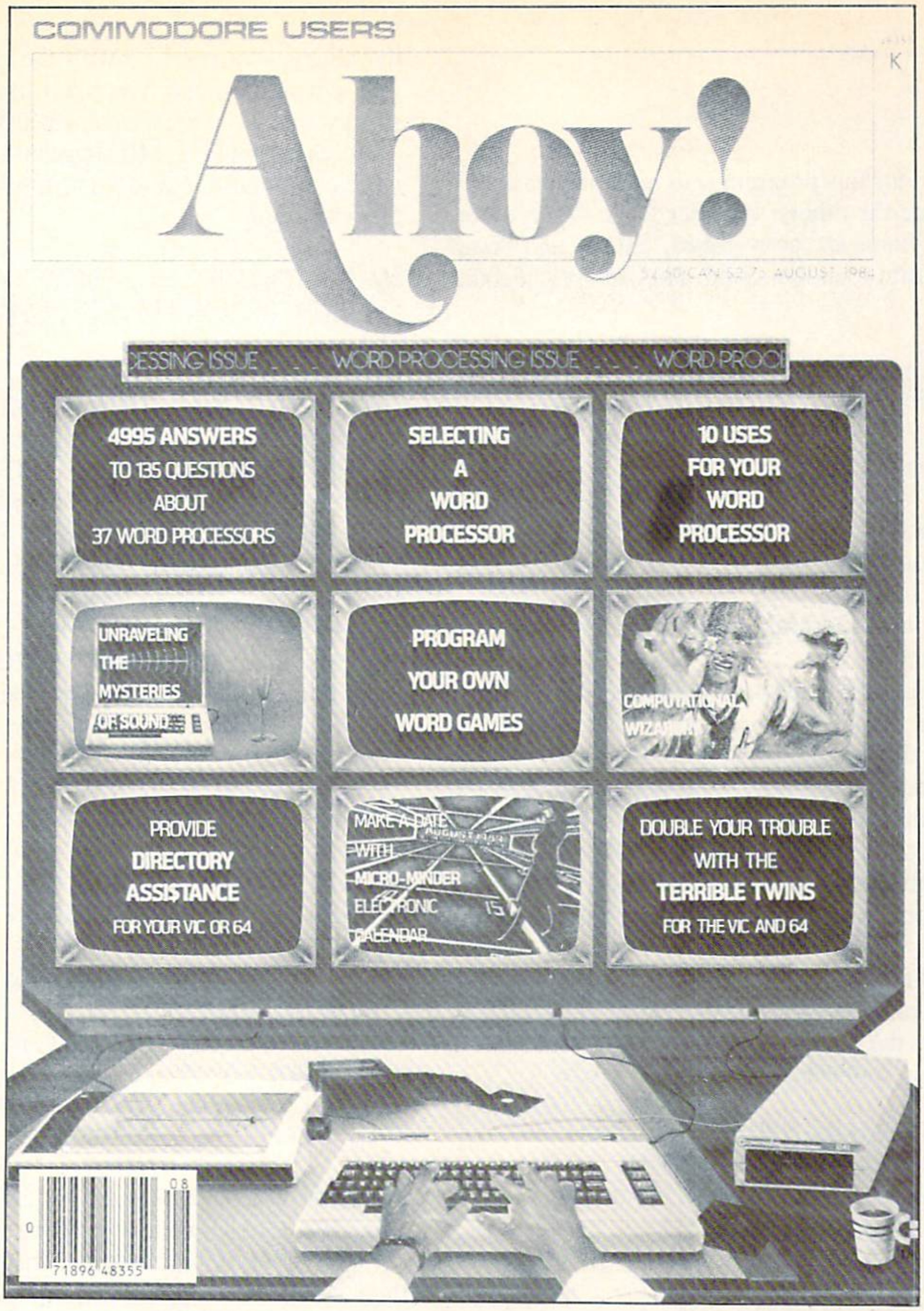
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```
•230 T$(N-1)=A$
•240 NEXT J
•250 CLOSE 4
```

The algorithm for this program is to hold one team constant and rotate the others. In order to get a more even distribution of home and away games, "Home" and "Away" are reversed from round to round. For example, if round one is

Home:	1	2	3	4
Away:	8	7	6	5

then round two will be

Away:	1	8	2	3
Home:	7	6	5	4

Team 1 remains fixed and the other teams rotate in a clockwise fashion.

In Fred's program you specify the number of teams and then their names. You may then select the screen or the printer for the output. If there is an odd number of teams, a no-game symbol (---) is added to the roster. The determination of oddness or evenness of N is determined by the (N AND 1) expression. Its value is zero if N is even and one if N is odd. This program will work for two or more teams, limited only by the computer's memory.

Readers had fun with *Problem #32-4: Centipede Scroller.* The problem was to make the word "centipede" to centipede down the screen. This solution from Barry King (Nome, AK) is representative of several others.

```
•1 REM COMMODARES PROBLEM #32-4:
•2 REM      CENTIPEDE SCROLLER
•3 REM SOLUTION BY
•4 REM      BARRY KING
•5 PRINT"[CLEAR][DOWN][DOWN]  HERE IT COM
ES.
•10 DIM A(959),L(10):S=1025
•20 FOR R=0 TO 24 STEP 2:FOR C=0 TO 37:A(
R*38+C)=S+R*40+C:NEXT:NEXT
•30 FOR R=1 TO 23 STEP 2:FOR C=0 TO 37:A(
R*38+C)=S+R*40+(37-C):NEXT:NEXT
•40 FOR P=950 TO 959:A(P)=P+75:NEXT
•50 W$=" CENTIPEDE":FOR N=1 TO 10:L(N)=AB
S(ASC(MID$(W$,N,1))-64):NEXT:PRINT"[CLEA
R]"
•60 FOR P=0 TO 949:FOR N=1 TO 10:POKE A(P
+N),L(N):NEXT:NEXT:GOTO 60
```

This program works on the C-64 and on the C-128 (40 column screen) since both computers have screen memory from address 1024 to address 2023. Lines 20 through 40 fill the array A( ) with the sequential addresses in which to POKE the centipede's characters. It takes a while for this array to be created, so be patient. Line 50 fills the character array L( ) with the values to be POKEd into screen memory. The main loop of the program is simply line 60 which is repeated indefinitely.

Jim Speers (Niles, MI) suggested a graphics centipede which you could add to this program by replacing line 50 with these:

```
50 FOR N=1 TO 10 : READ L(N) : NEXT
55 DATA 32,67,114,114,114,114,114,114,87
,61
```

Jim also suggested replacing the 32 in line 55 with a 46 if you prefer the centipede to leave a trail. The use of an array to store the sequential POKE locations allows you to modify the path of the centipede by changing the FOR/NEXT loops which define A( ).

Douglas Underwood (Walla Walla, WA) sent this machine language routine to POKE 14's into color RAM so that POKEd characters appear as light blue. He said this is necessary for C-64's with Revision 2 ROM's. If your computer displays only invisible centipedes, you may need to add this routine to the program above.

```
•1 REM - FILL COLOR RAM WITH CODE FOR
•2 REM - LIGHT BLUE.  FOR C-64'S WITH
•3 REM - REVISION 2 ROMS ONLY.
•4 REM - ADD TO CENTIPEDE SCROLLER PRGM
•5 REM       DOUGLAS UNDERWOOD
•6 GOSUB 100 : SYS 828
•100 FOR AD=828 TO 856:READ MC:POKE AD,MC
:NEXT:RETURN
•110 DATA 169,0,133,251,169,219,133,252
•120 DATA 160,0,136,169,14,145,251,192
•130 DATA 0,208,247,166,252,202,134,252
•140 DATA 224,215,208,238,96
```

Note that you must change line 55 above to line 155 if you add this machine language routine to your program.

Congratulations this month to the following readers for their solutions, suggestions, and letters:

J. Callaway (Orange Beach, AL)
William Colman (Hamden, CT)
Bucky Cox (Weeki Wachee, FL)
Ken Critton (New Haven, IN)
Bill Davies (Downington, PA)
Louis Dix (North Hampton, NH)
Craig Ewert (Crystal Lake, IL)
Thomson Fung (San Diego, CA)
John Gilmore (Sacramento, CA)
Charles Grady (Cleveland, TN)
David Hoffner (Brooklyn, NY)
Sol Katz (Lakewood, CO)
Barry King (Nome, AK)
Paul Lalli (McAlester, OK)
Yee Chang Lee (Yonkers, NY)
Wallace Leeker (Lemay, MO)
Dennis McGrath (Cicero, IL)
M. Naylor (N. Miami Beach, FL)
Fred Ransom (Oxnard, CA)
Kurt Schaeffer (Lebanon, PA)
Matt Shapiro (Fort Lee, NJ)
Jason Simpson (Everett, WA)
Paul Sobolik (Pittsburgh, PA)
Jim Speers (Niles, MI)
Steven Steckler (Columbia, MD)
D. Underwood (Walla Walla, WA)

Thanks also to our international writers this month: Mark Breault (Brandon, Manitoba) and Peter Zinterhof (Salzburg, Austria). We look forward to letters from programmers at all levels. If you have solved one or more of the *Commodares*, send us your solutions. Your ideas just might be worthy of publication for the world to see. ☐

FLOTSAM

Up until now I have not subscribed to *Ahoy!* because I am not all that interested in simple games (not always easy). I am more interested in programming aids and utilities that I can learn from or use in a program.

I want you to know that the money is in the mail. The program VERY-ABLE in the March 1986 issue convinced me that I don't want to do without your magazine. The only thing that program was missing was a choice between the screen and a printer. The program will print to a printer if you use the line below in the direct mode:

```
OPEN 4,4:CMD4:SYS 49152
```

Remember to (PRINT#4:CLOSE4) after the program is finished to close the channel. —William H. Duncan
Middletown, OH

I read with shock and regret that you are looking forward to receiving (and displaying) Amiga pictures in *Ahoy!'s Art Gallery.* To hell with the Amiga! I don't own one, can't afford one, and couldn't care less about seeing the pictures. I subscribe to *Ahoy!* because your fine mag supports my C-128. I understand that C-64/C-128 graphics don't hold a candle to the Amiga's, and most likely *Art Gallery* contents would be completely replaced with Amiga garbage. It is my understanding that nearly one half million C-128's have been sold, and less than 10% of that amount of Amigas are out there. It's fun to see the "best of the best" C-64/C-128 graphics—it's inspirational and sets a goal for us to try to aspire to (knowing our machines can do that). Amiga pictures would be of little interest, perhaps merely frustrating for us "commoners."

Don't get me wrong—I like the Amiga, and I'm very impressed with its capabilities. But with accessories, the Amiga package costs over $2000—out of the reach of many of us. Please reconsider this decision to include Amiga graphics at the expense of C-64/C-128 pictures. Idea: Perhaps a separate Amiga *Art Gallery* would be feasible, eh?

Other than that, keep up your state-of-the-art gallery, articles, and reviews. —Franz Stephan
Oshkosh, WI

Now that the price of a full-blown Amiga system has dipped to barely above $1000, Franz, we're sure you've jumped on the bandwagon. A separate Amiga Art Gallery *is a possibility for the future, but rest assured that in any event, the C-64 and C-128 artists in our readership will never be nosed out of the feature they made famous.*

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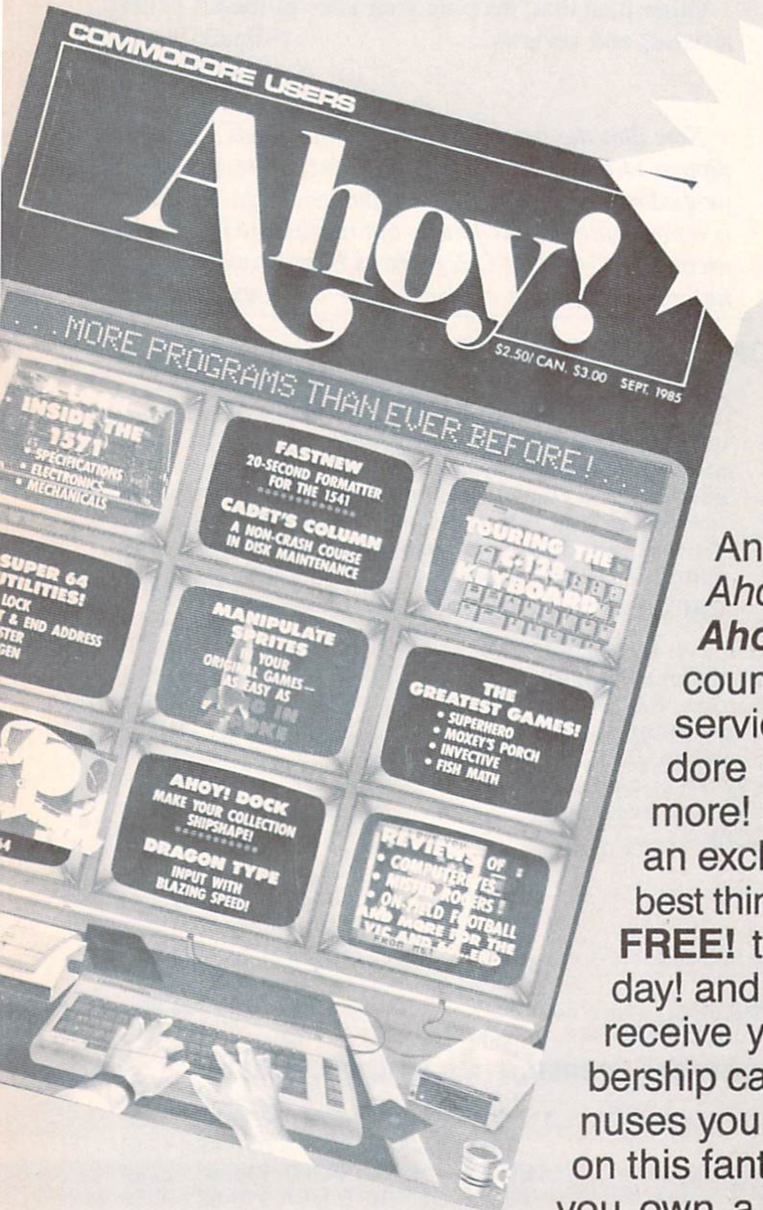
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THE COMMODORE MAGAZINE THAT OFFERS YOU MORE

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart. The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. □

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type		You Will See
[CLEAR]	Screen Clear	SHIFT	CLR/HOME	
[HOME]	Home		CLR/HOME	
[UP]	Cursor Up	SHIFT	↑ CRSR ↓	
[DOWN]	Cursor Down		↑ CRSR ↓	
[LEFT]	Cursor Left	SHIFT	←CRSR→	
[RIGHT]	Cursor Right		←CRSR→	
[SS]	Shifted Space	SHIFT	Space	
[INSERT]	Insert	SHIFT	INST/DEL	
[DEL]	Delete		INST/DEL	
[RVSON]	Reverse On	CNTRL	9	
[RVSOFF]	Reverse Off	CNTRL	0	
[UPARROW]	Up Arrow		↑	
[BACKARROW]	Back Arrow		←	
[PI]	PI		π	
[EP]	English Pound		£	

When You See	It Means	You Type		You Will See
[BLACK]	Black	CNTRL	1	
[WHITE]	White	CNTRL	2	
[RED]	Red	CNTRL	3	
[CYAN]	Cyan	CNTRL	4	
[PURPLE]	Purple	CNTRL	5	
[GREEN]	Green	CNTRL	6	
[BLUE]	Blue	CNTRL	7	
[YELLOW]	Yellow	CNTRL	8	
[F1]	Function 1		F1	
[F2]	Function 2	SHIFT	F1	
[F3]	Function 3		F3	
[F4]	Function 4	SHIFT	F3	
[F5]	Function 5		F5	
[F6]	Function 6	SHIFT	F5	
[F7]	Function 7		F7	
[F8]	Function 8	SHIFT	F7	

BUG REPELLENT By MICHAEL KLEINERT and DAVID BARRON

Bug Repellent is a checksum program used for proofreading BASIC listings typed in from *Ahoy!* magazine. For each program line you enter, *Bug Repellent* will produce a two-letter code that should match the code listed beside that line in the magazine.

Type in, save, and run the *Bug Repellent*. (If you have a C-64, type in the C-64 version. If you have a C-128, you will need to type in the C-64 version for use with C-64 programs, and the C-128 version for use with C-128 programs.) If you have typed in *Bug Repellent* properly, you will get the message BUG REPELLENT INSTALLED; otherwise you will get an error message. If you get an error message, double check the *Bug Repellent* program for typing mistakes. Type NEW and hit RETURN. Then type in and save, or load, the *Ahoy!* program you wish to check. Type in SYS 49152 for the C-64 version or SYS 3072 for the C-128 version and hit RETURN (this will begin execution of *Bug Repellent*). You will see the prompt SCREEN OR PRINTER ? Hit S if you want the codes listed on the screen, or P if you want them listed on the printer. To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to those listed to the right of the corresponding program lines. If you spot a difference, that line contains an error. Write down the numbers of the lines where the contradictions occur. LIST each line, locate the errors, and correct them.

COMMODORE 64 VERSION

```
·100 FOR X = 49152 TO 49488:READY:S=S+Y             AB
·110 IF Y<0 OR Y>255 THEN 130                        EA
·120 POKE X,Y:NEXT:GOTO140                           ID
·130 PRINT"[CLEAR][DOWN]**ERROR**":PRINT"[DOWN
]PLEASE CHECK LINE"PEEK(64)*256+PEEK(63):END       ID
·140 IF S<>44677 THEN PRINT"[CLEAR][DOWN]**ERR
OR**":PRINT"[DOWN]PLEASE CHECK DATA LINES 170
-500":END                                           HJ
·150 PRINT"[CLEAR]":POKE53280,0:POKE53281,6:PO
KE646,1                                             NP
·160 PRINT"[RVSON][6" "]C-64 BUG REPELLENT INS
TALLED[6" "]"                                       LF
·170 DATA32,161,192,165,43,133,251,165,44,133       DL
·180 DATA252,160,0,132,254,32,37,193,234,177        DB
·190 DATA251,208,3,76,138,192,230,251,208,2         OF
·200 DATA230,252,76,43,192,76,73,78,69,32           KN
·210 DATA35,32,0,169,35,160,192,32,30,171           CA
·220 DATA160,0,177,251,170,230,251,208,2,230        CE
·230 DATA252,177,251,32,205,189,169,58,32,210       JE
·240 DATA255,169,0,133,253,230,254,32,37,193        CL
·250 DATA234,165,253,160,0,76,13,193,133,253        NB
·260 DATA177,251,208,237,165,253,41,240,74,74       MB
·270 DATA74,74,24,105,65,32,210,255,165,253         EP
·280 DATA 41,15,24,105,65,32,210,255,169,13         GH
·290 DATA32,220,192,230,63,208,2,230,64,230         AN
·300 DATA251,208,2,230,252,76,11,192,169,153        NG
·310 DATA160,192,32,30,171,166,63,165,64,76         BF
·320 DATA231,192,96,76,73,78,69,83,58,32            EP
·330 DATA0,169,247,160,192,32,30,171,169,3          PJ
·340 DATA133,254,32,228,255,201,83,240,6,201        FK
·350 DATA80,208,245,230,254,32,210,255,169,4        FL
·360 DATA166,254,160,255,32,186,255,169,0,133       CL
·370 DATA63,133,64,133,2,32,189,255,32,192          GC
·380 DATA255,166,254,32,201,255,76,73,193,96        NN
·390 DATA32,210,255,173,141,2,41,1,208,249          NH
·400 DATA96,32,205,189,169,13,32,210,255,32         IM
·410 DATA204,255,169,4,76,195,255,147,83,67         KC
·420 DATA82,69,69,78,32,79,82,32,80,82              DC
·430 DATA 73,78,84,69,82,32,63,32,0,76              ML
·440 DATA44,193,234,177,251,201,32,240,6,138        GN
·450 DATA113,251,69,254,170,138,76,88,192,0         JK
·460 DATA0,0,0,230,251,208,2,230,252,96             NA
·470 DATA170,177,251,201,34,208,6,165,2,73          DM
·480 DATA255,133,2,165,2,208,218,177,251,201        JA
·490 DATA32,208,212,198,254,76,29,193,0,169         FM
·500 DATA13,76,210,255,0,0,0                        PA
```

COMMODORE 128 VERSION

```
·100 FAST:FOR X = 3072 TO 3520:READ Y:POKE X,Y
:S=S+Y:TRAP110:NEXT:SLOW                            IH
·110 SLOW:IF S<>49057 THEN PRINT"[CLEAR][DOWN]
**ERROR**":PRINT"[DOWN]PLEASE CHECK DATA LINE
S 140-390":END                                      JA
·120 PRINT"[CLEAR][DOWN]  C-128 BUG REPELLENT
INSTALLED"                                          II
·130 PRINT"[4" "]TYPE SYS 3072 TO ACTIVATE"         IN
·140 DATA 32,161,12,165,45,133,251,165,46,133,
252,160,0,132,254,32,37                             OF
·150 DATA 13,234,177,251,208,3,76,138,12,230,2
51,208,2,230,252,76,43                              NC
·160 DATA 12,76,73,78,69,32,35,32,0,169,35,160
,12,32,80,13,160,0,177                              OL
·170 DATA 251,170,230,251,208,2,230,252,177,25
1,32,89,13,169,58,32,98                             EF
·180 DATA 13,169,0,133,253,230,254,32,37,13,23
4,165,253,160,0,76,13                               JO
·190 DATA 13,133,253,177,251,208,237,165,253,4
1,240,74,74,74,74,24                                LC
·200 DATA 105,65,32,98,13,165,253,41,15,24,105
,65,32,98,13,169,13,32                              DE
·210 DATA 220,12,230,65,208,2,230,66,230,251,2
08,2,230,252,76,11,12                               GM
·220 DATA 169,153,160,12,32,80,13,166,65,165,6
6,76,231,12,96,76,73,78                             CP
·230 DATA 69,83,58,32,0,169,247,160,12,32,80,1
3,169,3,133,254,32,107                              HC
·240 DATA 13,201,83,240,6,201,80,208,245,230,2
54,32,98,13,169,4,166                               GK
·250 DATA 254,160,255,32,116,13,169,0,133,65,1
33,66,133,250,32,125,13                             LB
·260 DATA 32,134,13,166,254,32,143,13,76,73,13
,96,32,98,13,165,211                                JF
·270 DATA 234,41,1,208,249,96,32,89,13,169,13,
32,98,13,32,152,13,169,4                            GD
·280 DATA 76,161,13,147,83,67,82,69,69,78,32,7
9,82,32,80,82,73,78,84,69                           PL
·290 DATA 82,32,63,32,0,76,44,13,234,177,251,2
01,32,240,6,138,113,251,69                          OK
·300 DATA 254,170,138,76,88,12,0,0,0,0,230,251
,208,2,230,252,96,170,177                           FJ
·310 DATA 251,201,34,208,6,165,250,73,255,133,
250,165,250,208,218,177                             GA
·320 DATA 251,201,32,208,212,198,254,76,29,13,
0,169,13,76,98,13,0,0,32                            FI
·330 DATA 170,13,32,226,85,76,180,13,32,170,13
,32,50,142,76,180,13,32                             OF
·340 DATA 170,13,32,210,255,76,180,13,32,170,1
3,32,228,255,76,180,13,32                           AK
·350 DATA 170,13,32,186,255,76,180,13,32,170,1
3,32,189,255                                        BP
·360 DATA 76,180,13,32,170,13,32,192,255,76,18
0,13,32,170,13                                      FP
·370 DATA 32,201,255,76,180,13,32,170,13,32,20
4,255,76,180,13,32,170                              ID
·380 DATA 13,32,195,255,76,180,13,133,67,169,0
,141,0,255,165,67,96                                BJ
·390 DATA 133,67,169,0,141,1,255,165,67,96,0,0
,0                                                  IF
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1 – SAVEs what you have entered so far.

f3 – LOADs in a program worked on previously.

f5 – To continue on a line you stopped on after LOADing in the previous saved work.

f7 – Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

```
·100 POKE53280,12:POKE53281,11                              LL
·105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";    ED
·110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
 ]"                                                         MC
·115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"       DM
·120 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNATIONAL INC.
 [3" "]"                                                    DH
·125 FORA=54272TO54296:POKEA,0:NEXT                         IM
·130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
 KE54296,15                                                 NH
·135 FORA=680TO699:READB:POKEA,B:NEXT                       KO
·140 DATA169,251,166,253,164,254,32,216,255,96              HJ
·145 DATA169,0,166,251,164,252,32,213,255,96                JB
·150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B        KA
·155 GOSUB480:IFB=0THEN150                                  GN
·160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16              KE
·165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B               LO
·170 GOSUB470:IFB=0THEN150                                  EE
·175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16                  MN
·180 IFB>255THENB=B-255:POKE254,PEEK(254)+1                 GE
·185 POKE253,B:PRINT                                        HN
·190 REM  GET HEX LINE                                      IL
·195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8               NH
·200 FORB=0TO1:GOTO250                                      MP
·205 NEXTB                                                  ME
·210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340                  LE
·215 PRINT" [c P][LEFT]";                                   IK
·220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "                  PD
·225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255                 LK
·230 NEXT                                                   IA
·235 IFA%(8)<>TTHENGOSUB375:GOTO195                         LE
·240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195          BI
·245 REM    GET HEX INPUT                                   AB
·250 GETA$:IFA$=""THEN250                                   HK
·255 IFA$=CHR$(20)THEN305                                   HF
·260 IFA$=CHR$(133)THEN535                                  KH
·265 IFA$=CHR$(134)THEN560                                  JM
·270 IFA$=CHR$(135)THENPRINT" ":GOTO620                     EG
·275 IFA$=CHR$(136)THENPRINT" ":GOTO635                     AB
·280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295           DL
·285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295           MD
·290 GOSUB415:GOTO250                                       JJ
·295 PRINTA$"[c P][LEFT]";                                  OA
·300 GOTO205                                                CF
·305 IFA>0THEN320                                           PG
·310 A=-1:IFB=1THEN330                                      OI
·315 GOTO220                                                BM
·320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1                 HG
·325 A=A-1                                                  BE
·330 PRINTCHR$(20);:GOTO220                                 LK
·335 REM LAST LINE                                          AD
·340 PRINT" ":T=AD-(INT(AD/256)*256)                        GJ
·345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255               PL
·350 NEXT                                                   IA
·355 IFA%(A)<>TTHENGOSUB375:GOTO195                         NF
·360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                        HN
·365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535                 JA
·370 REM BELL AND ERROR MESSAGES                            FL
·375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415    DA
·380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415        FF
·385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
 5                                                          HD
·390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
 GOTO415                                                    OK
·395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415         FN
·400 PRINT"?ERROR IN SAVE":GOTO415                          PP
·405 PRINT"?ERROR IN LOAD":GOTO415                          PO
·410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT                PG
·415 POKE54276,17:POKE54276,16:RETURN                       BH
·420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN       IM
·425 REM GET FOUR DIGIT HEX                                 PC
·430 PRINT:PRINTB$;:INPUTT$                                 GM
·435 IFLEN(T$)<>4THENGOSUB380:GOTO430                       NP
·440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
 380:GOTO430                                                FJ
·445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN    GF
·450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN            EH
·455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN            KP
·460 T(A)=16:RETURN                                         NP
·465 REM ADRESS CHECK                                       LI
·470 IFAD>ENTHEN385                                         LB
·475 IFB<SRORB>ENTHEN390                                    KC
·480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395           MG
·485 RETURN                                                 IM
·490 REM ADDRESS TO HEX                                     EB
·495 AC=AD:A=4096:GOSUB520                                  FD
·500 A=256:GOSUB520                                         PE
·505 A=16:GOSUB520                                          MI
·510 A=1:GOSUB520                                           IL
·515 RETURN                                                 IM
·520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530             PE
·525 A$=CHR$(T+48)                                          JP
·530 PRINTA$;:AC=AC-A*T:RETURN                              AC
·535 A$="**SAVE**":GOSUB585                                 LH
·540 OPEN1,T,1,A$:SYS680:CLOSE1                             LH
·545 IFST=0THENEND                                          EO
·550 GOSUB400:IFT=8THENGOSUB420                             CM
·555 GOTO535                                                CL
·560 A$="**LOAD**":GOSUB585                                 NE
·565 OPEN1,T,0,A$:SYS690:CLOSE1                             MF
·570 IFST=64THEN195                                         LC
·575 GOSUB405:IFT=8THENGOSUB420                             AN
·580 GOTO560                                                CL
·585 PRINT" ":PRINTTAB(14)A$                                FG
·590 PRINT:A$="":INPUT"FILENAME";A$                         OM
·595 IFA$=""THEN590                                         DD
·600 PRINT:PRINT"TAPE OR DISK?":PRINT                       DF
·605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN           IG
·610 IFB$<>"T"THEN605                                       BO
·615 RETURN                                                 IM
·620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B               OH
·625 GOSUB475:IFB=0THEN620                                  GH
·630 PRINT:GOTO195                                          PH
·635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B               FA
·640 GOSUB475:IFB=0THEN635                                  IB
·645 PRINT:GOTO670                                          PP
·650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
 OSUB410:GOTO195                                            NK
·655 PRINT" ";:NEXTB                                        EC
·660 PRINT:AD=AD+8                                          GN
·665 GETB$:IFB$=CHR$(136)THEN195                            LI
·670 GOSUB495:PRINT": ";:GOTO650                            IB
```

THE SHADOW KNOWS, PART II FROM PAGE 27

Assembler required for program entry! See introductory article.

SPRITE2

```
*
* SPRITE2
*
              ORG     $1300
*
COLOR         EQU     $E0
*
TABLEN        EQU     $800
MAPLEN        EQU     1000
SCRLEN        EQU     8000
SP0ADR        EQU     $4E00
COLMAP        EQU     $5C00
NEWADR        EQU     $4000
*
SPRPTR        EQU     $5FF8
SPENA         EQU     $D015
SP0COL        EQU     $D027
SP0X          EQU     $11D6
SP0Y          EQU     $11D7
MSIGX         EQU     $11E6
YXPAND        EQU     $D017
XXPAND        EQU     $D01D
*
INDFET        EQU     $FF74
*
HMAX          EQU     320
VMID          EQU     100-8
*
R6510         EQU     $0001
BASE          EQU     $6000
CHRBAS        EQU     $D000
SCROLY        EQU     $D011
SVMCSB        EQU     $A2D
BORDER        EQU     $D020
CIACRE        EQU     $DC0E
CI2PRA        EQU     $DD00
CIADIR        EQU     $DD02
*
TEMPA         EQU     $C8
TMPB          EQU     TEMPA+2
TPTR          EQU     TEMPA
*
MVSRCE        EQU     $FA
DEST          EQU     MVSRCE+2
BPTR          EQU     DEST+2
*
TABSIZ        EQU     $0C00
*
HPSN          EQU     TABSIZ+2
VPSN          EQU     HPSN+2
CHAR          EQU     VPSN+1
ROW           EQU     CHAR+1
LINE          EQU     ROW+1
BYTE          EQU     LINE+1
BITT          EQU     BYTE+2
*
MPRL          EQU     BITT+1
MPRH          EQU     MPRL+1
MPDL          EQU     MPRH+1
MPDH          EQU     MPDL+1
PRODL         EQU     MPDH+1
PRODH         EQU     PRODL+1
FILVAL        EQU     PRODH+1
LENPTR        EQU     FILVAL+1
CHCODE        EQU     LENPTR+2
HPTR          EQU     CHCODE+2
VPTR          EQU     HPTR+2
ONEBYT        EQU     VPTR+1
COUNT         EQU     ONEBYT+2
LTTR          EQU     COUNT+1
*
              JMP     START
*
TEXT          DB      9,32,32,13
              DB      25,32,3,15
              DB      13,13,15,4
              DB      15,18,5,32
              DB      49,50,56,0
*
* BLOCK FILL ROUTINE
*
BLKFIL        LDA     FILVAL
              LDX     TABSIZ+1
              BEQ     PARTPG
              LDY     #0
FULLPG        STA     (TPTR),Y
              INY
              BNE     FULLPG
              INC     TPTR+1
              DEX
              BNE     FULLPG
PARTPG        LDX     TABSIZ
              BEQ     FINI
              LDY     #0
PARTLP        STA     (TPTR),Y
              INY
              DEX
              BNE     PARTLP
FINI          RTS
*
* MULTIPLY ROUTINE
*
MULT16        LDA     #0
              STA     PRODL
              STA     PRODH
              LDX     #17
              CLC
MULT          ROR     PRODH
              ROR     PRODL
              ROR     MPRH
              ROR     MPRL
              BCC     CTDOWN
              CLC
              LDA     MPDL
              ADC     PRODL
              STA     PRODL
              LDA     MPDH
              ADC     PRODH
              STA     PRODH
CTDOWN        DEX
              BNE     MULT
              RTS
*
* PLOT ROUTINE
*
* ROW=VPSN/8
*
PLOT          LDA     VPSN
              LSR     A
              LSR     A
              LSR     A
              STA     ROW
*
* CHAR=HPSN/8
*
              LDA     HPSN
              STA     TEMPA
              LDA     HPSN+1
              STA     TEMPA+1
              LDX     #3
DLOOP         LSR     TEMPA+1
              ROR     TEMPA
              DEX
              BNE     DLOOP
              LDA     TEMPA
              STA     CHAR
*
* LINE=VPSN AND 7
*
              LDA     VPSN
              AND     #7
              STA     LINE
*
* BIT=7-(HPSN AND 7)
*
              LDA     HPSN
              AND     #7
              STA     BITT
              SEC
              LDA     #7
              SBC     BITT
              STA     BITT
*
* CALCULATE BYTE
*
```

```
* MULTIPLY ROW * HMAX
*
         LDA   ROW
         STA   MPRL
         LDA   #0
         STA   MPRH
         LDA   #<HMAX
         STA   MPDL
         LDA   #>HMAX
         STA   MPDH
         JSR   MULT16
         LDA   MPRL
         STA   TEMPA
         LDA   MPRL+1
         STA   TEMPA+1
*
* ADD PRODUCT TO BASE
*
         CLC
         LDA   #<BASE
         ADC   TEMPA
         STA   TEMPA
         LDA   #>BASE
         ADC   TEMPA+1
         STA   TEMPA+1
*
* MULTIPLY 8 * CHAR
*
         LDA   #8
         STA   MPRL
         LDA   #0
         STA   MPRH
         LDA   CHAR
         STA   MPDL
         LDA   #0
         STA   MPDH
         JSR   MULT16
         LDA   MPRL
         STA   TMPB
         LDA   MPRH
         STA   TMPB+1
*
* ADD LINE
*
         CLC
         LDA   TMPB
         ADC   LINE
         STA   TMPB
         LDA   TMPB+1
         ADC   #0
         STA   TMPB+1
*
* TEMPA + TMPB = BYTE
*
         CLC
         LDA   TEMPA
         ADC   TMPB
         STA   TMPB
         LDA   TEMPA+1
         ADC   TMPB+1
         STA   TMPB+1
*
* BYTE=(BYTE)OR2^BIT
*
         LDX   BITT
         INX
         LDA   #0
         SEC
SQUARE   ROL
         DEX
         BNE   SQUARE
         LDY   #0
         ORA   (TMPB),Y
         STA   (TMPB),Y
         RTS
*
* GET CHCODE'S ADDRESS
*
GETADR   LDA   #0
         STA   CHCODE+1
         LDA   CHCODE
         CLC
         ASL   A
         ROL   CHCODE+1
         ASL   A
         ROL   CHCODE+1
         ASL   A
         ROL   CHCODE+1
         STA   CHCODE
*
         CLC
         LDA   CHCODE
         ADC   #<NEWADR
         STA   BPTR
         LDA   CHCODE+1
         ADC   #>NEWADR
         STA   BPTR+1
         RTS
*
* DRAW A CHARACTER
*
DRAWCH   LDA   LTTR
         STA   CHCODE
         JSR   GETADR
*
* A NESTED LOOP:
*
* (X IS OUTSIDE LOOP)
*
         LDX   #8
*
* COUNT 2 VERT LINES
*
SETLIN   LDA   #2
         STA   COUNT
*
DRAWLN   LDY   #0
         LDA   (BPTR),Y
         STA   ONEBYT
*
* THE INSIDE LOOP:
*
* (Y IS ZERO AT START)
*
RSHIFT   LDA   ONEBYT
         ASL   A
         STA   ONEBYT
         BCS   SHOW
*
         INC   HPSN
         BNE   ITSOK
         INC   HPSN+1
ITSOK    JMP   NOSHOW
*
* DISPLAY BIT
*
* SAVE X, Y REGISTERS
*
SHOW     TXA
         PHA
         TYA
         PHA
*
         JSR   PLOT
*
* NOW DO IT AGAIN
*
         INC   HPSN
         BNE   NOINC
         INC   HPSN+1
*
NOINC    JSR   PLOT
*
* RETRIEVE X, Y REGS
*
         PLA
         TAY
         PLA
         TAX
*
NOSHOW   INC   HPSN
         BNE   LEAP
         INC   HPSN+1
*
LEAP     INY
         CPY   #8
         BCC   RSHIFT
*
         INC   VPSN
*
         LDA   HPTR
         STA   HPSN
         LDA   HPTR+1
         STA   HPSN+1
```

```
*
* 2 LINES DONE YET?
*
          DEC   COUNT
          BNE   DRAWLN
*
          INC   BPTR
          BNE   OKMSB
          INC   BPTR+1
OKMSB     DEX
          BNE   SETLIN
          RTS
*
* COPY CHR SET INTO RAM
*
* PUT DATA IN NEW BLOCK
*
COPYCHRS  LDA   #<CHRBAS
          STA   MVSRCE
          LDA   #>CHRBAS
          STA   MVSRCE+1
*
          LDA   #<NEWADR
          STA   DEST
          LDA   #>NEWADR
          STA   DEST+1
*
          LDA   #<TABLEN
          STA   LENPTR
          LDA   #>TABLEN
          STA   LENPTR+1
*
          LDY   #0
          LDX   LENPTR+1
          BEQ   MVPART
MVPAGE    JSR   GETDATA
          INY
          BNE   MVPAGE
          INC   MVSRCE+1
          INC   DEST+1
          DEX
          BNE   MVPAGE
MVPART    LDX   LENPTR
          BEQ   MVEXIT
MVLAST    JSR   GETDATA
          INY
          DEX
          BNE   MVLAST
MVEXIT    RTS
*
* MOVEDATA
*
GETDATA   PHA
          TXA
          PHA
          LDA   #MVSRCE
          LDX   #14
          JSR   INDFET
          STA   (DEST),Y
          PLA
          TAX
          PLA
          RTS
*
*
* MAIN ROUTINE
*
START     JSR   COPYCHRS
*
          LDA   #$20
          STA   $D8
*
* USE VIDEO BANK 1
*
          LDA   #0
          STA   $FF00
          LDA   CI2PRA
          AND   #$FC
          ORA   #$02
          STA   CI2PRA
          STA   $FF01
*
* PUT SCR MAP AT $6000
* PUT CLR MAP AT $5C00
*
          LDA   #$78
          STA   SVMCSB
*
* CLEAR BIT MAP
*
          LDA   #0
          STA   FILVAL
          LDA   #<BASE
          STA   TPTR
          LDA   #>BASE
          STA   TPTR+1
          LDA   #<SCRLEN
          STA   TABSIZ
          LDA   #>SCRLEN
          STA   TABSIZ+1
          JSR   BLKFIL
*
* SET COLORS
*
          LDA   #COLOR
          STA   FILVAL
          LDA   #<COLMAP
          STA   TPTR
          LDA   #>COLMAP
          STA   TPTR+1
          LDA   #<MAPLEN
          STA   TABSIZ
          LDA   #>MAPLEN
          STA   TABSIZ+1
          JSR   BLKFIL
          LDA   #13
          STA   BORDER
*
* POSITION MESSAGE
*
          LDA   #8
          STA   HPSN
          STA   HPTR
          LDA   #0
          STA   HPSN+1
          STA   HPTR+1
          LDA   #VMID
          STA   VPSN
          STA   VPTR
*
* PRINT LINE
*
          LDX   #0
DISP      LDA   TEXT,X
          CMP   #0
          BEQ   DONE
          STA   LTTR
          TXA
          PHA
          JSR   DRAWCH
          PLA
          TAX
*
* ADVANCE CURSOR
*
          CLC
          LDA   HPTR
          ADC   #16
          STA   HPTR
          STA   HPSN
          LDA   HPTR+1
          ADC   #0
          STA   HPTR+1
          STA   HPSN+1
          LDA   VPTR
          STA   VPSN
*
* PRINT NEXT LETTER
*
          INX
          JMP   DISP
*
DONE      NOP
*
* DISPLAY SPRITE #0
*
* DEFINE SPRITE
*
* CLEAR SPRITE MAP
*
          LDA   #$00
          STA   FILVAL
          LDA   #<SP0ADR
          STA   TPTR
```

```
        LDA   #>SP0ADR
        STA   TPTR+1
        LDA   #64
        STA   TABSIZ
        LDA   #0
        STA   TABSIZ+1
        JSR   BLKFIL
*
* COPY HEART CHARACTER
*
        LDA   #<SP0ADR
        STA   TEMPA
        LDA   #>SP0ADR
        STA   TEMPA+1
        LDA   #83
        STA   CHCODE
        JSR   GETADR
        LDY   #0
        LDX   #8
*
DEFSP0  LDA   (BPTR),Y
        STA   (TEMPA),Y
*
        INC   BPTR
        INC   TEMPA
        INC   TEMPA
        INC   TEMPA
*
        DEX
        BNE   DEFSP0
*
* SET SPRITE POINTER
*
        LDA   #$38
        STA   SPRPTR
*
        LDA   #0
        STA   $FF00
*
* EXPAND SPRITE
*
        LDA   #1
        STA   XXPAND
        STA   YXPAND
*
* TURN ON SPRITE #0
*
        LDA   #1
        STA   SPENA
*
* MAKE SPRITE RED
*
        LDA   #10
        STA   SP0COL
*
        STA   $FF01
*
* POSITION SPRITE
*
        LDA   #54
        STA   SP0X
        LDA   #0
        STA   MSIGX
        LDA   #34
        STA   SP0Y
*
* MOVE SPRITE DOWN
*
DROP    INC   SP0Y
*
* DELAY LOOP
*
        LDX   #$FF
XLOOP   LDY   #$10
YLOOP   DEY
        BNE   YLOOP
        DEX
        BNE   XLOOP
*
        LDA   SP0Y
        CMP   #142
        BNE   DROP
*
INF     JMP   INF
```

FILE MANIPULATOR
FROM PAGE 20

PLANETARY MOONS DATABASE

```
•1 REM                                   JD
•2 REM  --- PLANETARY MOONS DATABASE --- GI
•3 REM            FOR C-128              IL
•4 REM         RUPERT REPORT #36         OM
•5 REM                                   JD
•10 FOR N=1 TO 24 : SP$=SP$+" " : NEXT   AN
•20 DATA MERCURY,0,VENUS,0,EARTH,1,MARS,2 OF
•30 DATA JUPITER,16,SATURN,17,URANUS,5   GL
•40 DATA NEPTUNE,2,PLUTO,1               BB
•50 DOPEN#1,"PLANETS",L25                AO
•60 FOR NR=1 TO 9                        PO
•70 READ P$,M$                           JM
•80 WR$=SP$                              EB
•90 MID$(WR$,1)=P$                       IG
•100 MID$(WR$,15)=M$                     JO
•110 RECORD#1,NR,1                       IK
•120 PRINT#1,WR$                         LM
•130 PRINT DS$,WR$                       FI
•140 NEXT                                IA
•150 DCLOSE                              AM
```

FILE MANIPULATOR

```
•1 REM                                         JD
•2 REM       "FILE MANIPULATOR"                GN
•3 REM  --- RELATIVE FILE MODEL ---            JP
•4 REM           FOR C-128                     IL
•5 REM        RUPERT REPORT #36                OM
•6 REM                                         JD
•10 TRAP 1000                                  JM
•20 SP$=" " : FOR K=1 TO 6 : SP$=SP$+SP$
 : NEXT  : REM  64 SPACES                      KO
•30 :REM === FILE DEFINITION ============      KE
•40 F$="PLANETS"          : REM  FILENAME      IL
•50 NR=60                 : REM 60 RECORDS     PI
•60 : REM  2 FIELDS, LENGTHS 14 & 10           OP
•70 FLD(1)=14 : FLD(2)=10                      GA
•80 : REM  POINTERS TO START OF FIELDS         NG
•90 PT(1)=1 : PT(2)=15                         LD
•100 :REM === INITIALIZE FILE ===========      JF
•110 :REM   25 BYTES PER RECORD                EP
•120 :REM    MAX # RECORDS = NR                IC
•130 DOPEN#1,(F$),L25                          EA
•140 RECORD#1,NR                               DK
•150 :REM IF LAST RECORD EMPTY, WRITE IT       EB
•160 IF VAL(DS$)=50 THEN PRINT#1,"*END*"       KG
•170 DCLOSE                                    AM
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 117 and 118 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
•180 :REM ------------------------------- PO
•190 :REM === MAIN LOOP ================= CE
•200 INPUT"READ, WRITE, OR QUIT (R/W/Q)";
 U$                                       BN
•210 ON INSTR("RWQ",U$) GOTO 260,400,230 MO
•220 GOTO 200                             BO
•230 DCLOSE : END                         ML
•240 REM -------------------------------- DD
•250 REM ==== READ ROUTINE ============== ED
•260 DOPEN#1,(F$)                         EP
•270 INPUT">READ WHICH RECORD (0=STOP)";N HC
•280 IF N=0 THEN DCLOSE : GOTO 200        OC
•290 IF N<1 OR N>NR THEN 270              HM
•300 GOSUB 320  :REM  READ & DISPLAY      DL
•310 GOTO 270                             CJ
•320 :REM  'READ & DISPLAY' SUBROUTINE    BD
•330 RECORD#1,N                           OF
•340 INPUT#1,RD$                          JJ
•350 PRINT"FULL RECORD ="RD$              BF
•360 FOR F=1 TO 2                         II
•370 PRINT"FIELD #"F"="MID$(RD$,PT(F),FLD
 (F)) : NEXT : PRINT                      AI
•380 RETURN                               IM
•390 REM ===== WRITE ROUTINE ============ GD
•400 DOPEN#1,(F$)                         EP
•410 INPUT">WRITE WHICH RECORD(0=STOP)";N GE
•420 IF N=0 THEN DCLOSE : GOTO 200        OC
•430 IF N<1 OR N>NR THEN 410              GE
•440 :REM  READ & DISPLAY ROUTINE         DP
•450 GOSUB 320                            CJ
•460 INPUT">WRITE WHICH FIELD (0,1,2)";F  DI
•470 IF F<1 OR F>2 THEN 410               MF
•480 PRINT"ENTER UP TO"FLD(F)"CHARACTERS  PB
•490 PRINT"  "; : FOR K=1 TO FLD(F) : PRI
 NT"-"; : NEXT : PRINT                    HP
•500 U$="" : INPUT U$       :REM GET DATA OF
•510 U$=U$+SP$              :REM  PAD IT  FP
•520 U$=LEFT$(U$,FLD(F))    :REM TRUNCATE PF
•530 :REM  GET THE CURRENT RECORD         CN
•540 WR$=RD$     :REM  FROM READ ROUTINE  PH
•550 WR$=WR$+SP$          :REM  PAD IT    IK
•560 MID$(WR$,PT(F))=U$  :REM  UPDATE IT  IG
•570 WR$=LEFT$(WR$,24)   :REM TRUNCATE    GL
•580 RECORD#1,N,1       :REM SET POINTER  FL
•590 PRINT#1,WR$        :REM WRITE RECORD BN
•600 GOTO 410                             DP
•999 :REM =============================== KJ
•1000 PRINT DS$,ERR$(ER),"LINE "EL        JA
•1010 RESUME NEXT                         HA
```

THE ARTIST
FROM PAGE 34

BOOTER

```
•5 REM *===* THE ARTIST (V2.0) BOOTER *==
 =*                                       DI
•10 COLOR0,1:COLOR4,1:PRINT"[CLEAR][DOWN]
 [WHITE]ONE MOMENT PLEASE.                JL
•20 PRINT"[DOWN][BLACK]RUN"CHR$(34)"THE A
 RTIST                                    FO
•30 PRINT"[HOME]                          MI
•40 POKE842,13:POKE208,1:POKE46,108:POKE2
 7648,.:NEW                               HH
```

SPRITE DATA

```
>00E00 00 00 00 00 00 00 00 00
>00E08 00 00 00 00 00 30 00 00
>00E10 30 00 00 30 00 00 78 00
>00E18 00 CC 00 0F 87 C0 00 CC
>00E20 00 00 78 00 00 30 00 00
>00E28 30 00 00 30 00 00 00 00
>00E30 00 00 00 00 00 00 00 00
>00E38 00 00 00 00 00 00 00 00
>00E40 00 00 00 00 00 00 00 00
>00E48 00 00 00 00 00 00 00 00
>00E50 00 00 00 00 00 00 00 00
>00E58 00 00 00 00 30 00 00 00
>00E60 00 00 00 00 00 00 00 00
>00E68 00 00 00 00 00 00 00 00
>00E70 00 00 00 00 00 00 00 00
>00E78 00 00 00 00 00 00 00 00
>00E80 00 00 00 60 00 00 60 00
>00E88 00 10 00 00 08 00 00 04
>00E90 00 00 00 00 00 7B 66 00
>00E98 63 66 00 7B 66 00 63 66
>00EA0 00 63 77 00 00 00 00 00
>00EA8 00 00 00 00 00 00 00 00
>00EB0 00 00 00 00 00 00 00 00
>00EB8 00 00 00 00 00 00 00 00
```

ML

```
>00B00 A0 00 B1 FA 91 FC C8 D0
>00B08 F9 E6 FB E6 FD C6 FE A6
>00B10 FE D0 EF 60 00 00 00 00
```

THE ARTIST

```
•2 TRAP306:GOSUB280:GOTO52                PJ
•4 :                                      DI
•6 :                                      DI
•8 :        THE ARTIST (V2.0)             FI
•10 :                                     DI
•12 :                                     DI
•14 :          DENOY  DEBOER              GL
•16 :     70 B SOUTH MAGNOLIA DR.         KD
•18 :    SATELLITE BEACH, FL 32937        EL
•20 :        (305) 773-9343               IC
•22 :                                     DI
•24 :                                     DI
```

```
·26 :                                        DI
·28 REM *===* DRAWING MODE *===*             BO
·32 J=JOY(2):X=X-(J>1ANDJ<5)+(J>5ANDJ<9):
 Y=Y-(J>3ANDJ<7)+(J=8ORJ=1ORJ=2):IFJ>127T
 HENPRINT"[CNTRL G]";:P=-P:GOSUB322           DC
·34 SPRITE8,1,RND(1)*16+1:MOVSPR8,X*2+Q+1
 ,Y+U:IFP=-1THENDRAWDC,X,Y                    DO
·36 GOSUB44:IFA$<>""THEN52:ELSE32             IL
·38 REM *===* READ JOYSTICK *===*             GI
·40 J=JOY(2):IFJ=.THENS=.:RETURN:ELSES=CS
 :A=(J-1)*45:RETURN                           JH
·42 REM *===* CHECK TO SEE IF USER WANTS
 TO SAVE OR RESTORE SCREEN FROM BUFFER *=
 ==*                                          FO
·44 GETA$:IFA$="S"THENPRINT"[CNTRL G]";:G
 OTO230:REM BUFFER SAVE SCREEN                EN
·46 IFA$="R"THENPRINT"[CNTRL G]";:GOTO240
 :REM RESTORE SCREEN                          CL
·48 RETURN                                    IM
·50 REM *===* MAIN MENU *===*                 CA
·52 GRAPHIC0:COLOR0,1:OC=.:SPRITE1,1,2,1:
 SPRITE2,1,2,1:GOSUB286:COLOR1,C1+1:COLOR
 2,C2+1:COLOR3,C3+1:IFC4>.ANDC4<17THENCOL
 OR4,C4:ELSEC4=1:COLOR4,C4                    DM
·54 GOSUB40:IFJ>127THENMOVSPR8,A#.:PRINT"
 [CNTRL G]";:GOTO62:REM BUTTON PUSHED         GM
·56 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GET
 CS:IFCS>.THENOS=CS:ELSECS=OS                 CL
·58 GOTO54                                    PP
·60 REM *===* CHECK TO SEE WHAT SELECTION
 THE USER MADE *===*                          BO
·62 X1=RSPPOS(8,.):Y1=RSPPOS(8,1):X=(X1-Q
 )/8:Y=(Y1-U)/8                               JL
·64 IFY>.ANDY<4THEN78                         KJ
·66 IFY>7ANDY<11THEN84                        OL
·68 IFY>11ANDY<15THEN92                       EI
·70 IFY>15ANDY<19THEN100                      HM
·72 IFY>20ANDY<23THEN120                      GJ
·74 GOTO52                                    PB
·76 REM *===* THE VARIOUS OPTIONS *===*       LI
·78 IFX>.ANDX<7THEN174:REM LOAD               NJ
·80 IFX>7ANDX<14THEN166:REM SAVE              AJ
·82 IFX>14ANDX<21THENGOSUB290:J=.:DO WHIL
 E J<127:J=JOY(2):LOOP:PRINT"[CNTRL G]";:
 GOTO52:REM VIEW                              IN
·84 IFX>.ANDX<6THENWIDTH2:SPRITE8,,,,1:Q=
 3:GOTO54:REM LARGE  BRUSH                    IH
·86 IFX>6ANDX<12THENWIDTH1:SPRITE8,,,,0:Q
 =13:GOTO54:REM SMALL BRUSH                   DC
·88 IFX>12ANDX<16THENSPRSAV1,8:GOTO54:REM
 CROSSHAIR CURSOR                             FG
·90 IFX>16ANDX<20THENSPRSAV2,8:GOTO54:REM
 SOLID CURSOR                                 AD
·92 GOSUB322:IFX>.ANDX<5THENGOSUB290:GOTO
 212:REM RAYS                                 OC
·94 IFX>5ANDX<12THENGOSUB290:GOTO136:REM
 CIRCLE                                       JA
·96 IFX>12ANDX<16THENGOSUB290:GOTO156:REM
 BOX                                          AE
·98 IFX>16ANDX<20THEN224:REM NEW              NO
·100 IFX>.ANDX<5THENX=85:Y=90:GOSUB290:P=
 1:GOTO32:REM DRAW                            ED
·102 IFX>5ANDX<10THEND1=.:GOSUB290:GOTO18
 8:REM LINE                                   EJ
·104 IFX>10ANDX<15THENGOSUB290:SPRSAV3,8:
 GOSUB322:GOTO130:REM FILL                    HJ
·106 IFX>15ANDX<20THEN198:REM TEXT            IE
·108 REM *===* DETERMINE THE PALETTE TO B
 E USED *===*                                 MD
·110 IFX>22ANDX<27THENDC=0:IFOC=1THENC0=C
 -1:GOTO52                                    JL
·112 IFX>26ANDX<31THENDC=1:IFOC=1THENC1=C
 -1:GOTO52                                    IM
·114 IFX>30ANDX<35THENDC=2:IFOC=1THENC2=C
 -1:GOTO52                                    IB
·116 IFX>34ANDX<39THENDC=3:IFOC=1THENC3=C
 -1:GOTO52                                    NJ
·118 REM *===* DETERMINE COLOR TO BE PUT
 INTO PALETTE *===*                           OA
·120 OC=1:IFX>3ANDX<6THENC=2:GOTO54:REM W
 HITE                                         NL
·122 IFX>5ANDX<8THENC=1:GOTO54:REM BLACK      BF
·124 C=INT(X/2)-1:IFC>16THENOC=.:REM CALC
 ULATE COLOR                                  PL
·126 GOTO 54                                  PP
·128 REM *===* FILL *===*                     NP
·130 GOSUB40:IFJ>127THENMOVSPR8,A#.:PRINT
 "[CNTRL G]";:X=RSPPOS(8,.)-24:Y=RSPPOS(8
 ,1)-50:PAINTDC,X/2,Y:GOTO130                 MH
·132 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
 SUB44:IFA$=""THEN130:ELSESPRSAV1,8:GOTO5
 2                                            DF
·134 REM *===* CIRCLE *===*                   GF
·136 GOSUB40:IFJ>127THENMOVSPR8,A#.:PRINT
 "[CNTRL G]";:X=RSPPOS(8,.)-Q:Y=RSPPOS(8,
 1)-U:DRAWDC,X/2,Y:CX=RDOT(.):CY=RDOT(1):
 GOSUB322:GOTO140                             DI
·138 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
 SUB44:IFA$=""THEN136:ELSE52                  OO
·140 GOSUB40:IFA>.ANDA<>180THENS=.:REM RE
 AD JOYSTICK                                  PC
·142 IFJ>127THENMOVSPR8,A#.:PRINT"[CNTRL
 G]";:Y1=RSPPOS(8,1)-U:Y2=ABS(Y1-Y):DRAWD
 C,X/2,Y1:MOVSPR8,CX*2+Q,CY+U:GOSUB322:GO
 TO146                                        DJ
·144 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
 SUB44:IFA$=""THEN140:ELSE52                  EJ
·146 GOSUB40:IFA<>90ANDA<>270THENS=.:REM
 READ JOYSTICK                                EH
·148 IFJ>127THENMOVSPR8,A#.:PRINT"[CNTRL
 G]";:X1=RSPPOS(8,.):IFX1=CX*2+QANDRSPPOS
 (8,1)=CY+UTHENCIRCLEDC,X/2,Y,Y2*SC,Y2,,,
 ,1:GOTO136                                   KF
·150 IFJ>127THENX2=ABS((X1-Q)-X):CIRCLEDC
 ,X/2,Y,X2/2,Y2,,,,1:GOTO136                  PA
·152 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
```

```
SUB44:IFA$=""THEN146:ELSE52                PP
•154 REM *===* BOX *===*                     HO
•156 GOSUB40:IFJ>127THENMOVSPR8,A#.:PRINT
 "[CNTRL G]";:X=RSPPOS(8,.)-Q:Y=RSPPOS(8,
 1)-U:DRAWDC,X/2,Y:GOSUB322:GOTO160          IG
•158 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
 SUB44:IFA$=""THEN156:ELSE52                 JI
•160 GOSUB40:IFJ>127THENMOVSPR8,A#.:PRINT
 "[CNTRL G]";:Y1=RSPPOS(8,1)-U:X1=RSPPOS(
 8,.)-Q:BOXDC,X/2,Y,X1/2,Y1:GOSUB322:GOTO
 156                                          KM
•162 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
 SUB44:IFA$=""THEN160:ELSE52                 JL
•164 REM *===* SAVE *===*                    ML
•166 N$="":CHAR,0,24,"[WHITE]NAME?":GOSUB
 294                                          CA
•168 GOSUB276:IFN$=""THEN52:ELSEIFLEN(N$)
 >12THENE$="NAME MUST BE 12 CHARACTERS OR
  LESS":GOSUB288:GOTO52                      BO
•170 POKE8168,C0:POKE8169,C1:POKE8170,C2:
 POKE8171,C3:BSAVE(N$)+".PIC",B0,P7168 TO
  P16192:GOSUB182:BSAVE(N$)+".COL",B15,P5
 5296 TO P56395:GOSUB184:GOTO52              KF
•172 REM *===* LOAD *===*                    KA
•174 N$="":CHAR,0,24,"[WHITE]NAME?":GOSUB
 294                                          CA
•176 GOSUB276:IFN$=""THEN52:ELSEIFLEN(N$)
 >12THENE$="NAME MUST BE 12 CHARACTERS OR
  LESS":GOSUB288:GOTO52                      BO
•178 FAST:GRAPHICM:GOSUB182:BLOAD(N$)+".C
 OL",B15,P55296:GOSUB184                     NJ
•180 BLOAD(N$)+".PIC",B0,P7168:C0=PEEK(81
 68):C1=PEEK(8169):C2=PEEK(8170):C3=PEEK(
 8171):GOTO52                                IL
•182 BANK15:POKE(DEC("D01A")),PEEK(DEC("D
 01A"))AND254:POKE1,PEEK(1)AND254:RETURN     MJ
•184 POKE1,PEEK(1)OR1:POKE(DEC("D01A")),P
 EEK(DEC("D01A"))OR1:SLOW:RETURN             KH
•186 REM *===* LINE *===*                    MC
•188 GOSUB40:IFJ>127THENMOVSPR8,A#.:PRINT
 "[CNTRL G]";:X=RSPPOS(8,.)-Q:Y=RSPPOS(8,
 1)-U:DRAWDC,X/2,Y:GOSUB322:GOTO192          IP
•190 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
 SUB44:IFA$=""THEN188:ELSE52                 PN
•192 GOSUB40:IFJ>127THENMOVSPR8,A#.:PRINT
 "[CNTRL G]";:X1=RSPPOS(8,.)-Q:Y1=RSPPOS(
 8,1)-U:DRAWDC,X/2,Y TO X1/2,Y1:GOSUB322:
 S=.:GOTO190                                  LN
•194 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
 SUB44:IFA$=""THEN192:ELSE52                 OA
•196 REM *===* TEXT *===*                    PB
•198 N$="":CHAR,0,24,"[WHITE]TEXT:":GOSUB
 294                                          MD
•200 GOSUB276:IFN$=""THEN52                  IH
•202 PRINT"[CNTRL G]";:CHAR,12,24,"1=[RVS
 ON]RVS[RVSOFF][3" "]2=NORMAL":TM=DC:GETK
 EYA$:IFA$="2"THENTM=.                       MB
•204 GOSUB276:GOSUB290                       JA
•206 GOSUB40:IFJ>127THENMOVSPR8,A#.:PRINT
 "[CNTRL G]";:X1=RSPPOS(8,.):Y1=RSPPOS(8,
 1):X=(X1-Q)/8:Y=(Y1-U)/8:CHARDC,X,Y,N$,T
 M:GOTO206                                   FE
•208 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
 SUB44:IFA$=""THEN206:ELSE52                 NE
•210 REM *===* RAYS *===*                    MN
•212 GOSUB40:IFJ>127THENMOVSPR8,A#.:PRINT
 "[CNTRL G]";:X=RSPPOS(8,.)-Q:Y=RSPPOS(8,
 1)-U:DRAWDC,X/2,Y:GOSUB322:GOTO216          II
•214 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
 SUB44:IFA$=""THEN212:ELSE52                 EJ
•216 GOSUB40:IFJ>128THENX1=RSPPOS(8,.)-Q:
 Y1=RSPPOS(8,1)-U:DRAWDC,X/2,Y TO X1/2,Y1 AB
•218 IFJ=128THENGOSUB322:GOSUB40:IFJ=128T
 HEN212                                       BE
•220 MOVSPR8,A#S:SPRITE8,1,RND(1)*16+1:GO
 SUB44:IFA$=""THEN216:ELSE52                 KN
•222 REM *===* NEW *===*                     LH
•224 CHAR,0,24,"[WHITE]ARE YOU SURE? (Y/N
 )":GETKEYA$:IFA$="Y"THENGRAPHICM,1:GRAPH
 IC0                                          DI
•226 GOSUB276:GOTO52                         FN
•228 REM *===* SAVE SCREEN TO BUFFER *===
 *                                            AF
•230 FAST:R0=C0:R1=C1:R2=C2:R3=C3            ON
•232 POKE250,.:POKE251,28:POKE252,.:POKE2
 53,64:POKE254,36:BANK0:SYS2816:REM SAVE
 IMAGE                                        KM
•234 GOSUB182:FORI=.TOD:C(I)=PEEK(W+I):NE
 XT:GOSUB184:REM SAVE COLOR                  JH
•236 PRINT"[CNTRL G]";:A$="":RETURN          JN
•238 REM *===* RESTORE SCREEN FROM BUFFER
  *===*                                       JD
•240 FAST:POKE250,.:POKE251,64:POKE252,.:
 POKE253,28:POKE254,36:BANK0:SYS2816:REM
 RESTORE IMAGE                                OB
•242 C0=R0:C1=R1:C2=R2:C3=R3                 PJ
•244 GOSUB182:FORI=.TOD:POKEW+I,C(I):NEXT
 :GOSUB184:REM RESTORE COLOR                 ME
•246 COLOR0,C0+1:PRINT"[CNTRL G]";:A$="":
 RETURN                                       EE
•248 REM *===* PRINT MENU SCREEN *===*       BP
•250 PRINT"[CLEAR][WHITE][RVSON][s M][38"
  "][s N] [RVSOFF][6" "][RVSON] [RVSOFF][
 6" "][RVSON] [RVSOFF][6" "][RVSON] [RVSO
 FF] [RVSON] [RVSOFF][15" "][RVSON] ";       JO
•252 PRINT"[RVSON] [RVSOFF] [YELLOW]LOAD[
 WHITE] [RVSON] [RVSOFF] [YELLOW]SAVE[WHI
 TE] [RVSON] [RVSOFF] [YELLOW]VIEW[WHITE]
  [RVSON] [RVSOFF] [RVSON] "SPC(15)"  [RV
 SOFF][6" "][RVSON] [RVSOFF][6" "][RVSON]
  [RVSOFF][6" "][RVSON] [RVSOFF] [RVSON]
 "SPC(15)" ";                                FJ
•254 PRINT"[RVSON][22" "][RVSOFF] [RVSON]
  [RVSOFF][15" "][RVSON]  "TAB(23)" "SPC(
 15)" ";                                     LH
•256 PRINT"[RVSON][21" "][RVSOFF]  [RVSON
```

```
] "SPC(15)"  [RVSOFF][5" "][RVSON] [RVSO
FF][5" "][RVSON] [RVSOFF][3" "][RVSON] [
RVSOFF][3" "][RVSON] [RVSOFF]  [RVSON] "
SPC(15)" ";                              PG
·258 PRINT"[RVSON] [RVSOFF]LARGE[RVSON] [
RVSOFF]SMALL[RVSON] [RVSOFF][3" "][RVSON
] [RVSOFF][3" "][RVSON] [RVSOFF]  [RVSON
] "SPC(15)"  [RVSOFF][5" "][RVSON] [RVSO
FF][5" "][RVSON] [RVSOFF][3" "][RVSON] [
RVSOFF][3" "][RVSON] [RVSOFF]  [RVSON] "
SPC(15)" ";                              OK
·260 PRINT"[RVSON][21" "][RVSOFF]  [RVSON
] "SPC(15)"  [RVSOFF][4" "][RVSON] [RVSO
FF][6" "][RVSON] [RVSOFF][3" "][RVSON] [
RVSOFF][3" "][RVSON] [RVSOFF]  [RVSON] "
SPC(15)" ";                              GA
·262 PRINT"[RVSON] [RVSOFF]RAYS[RVSON] [R
VSOFF]CIRCLE[RVSON] [RVSOFF]BOX[RVSON] [
RVSOFF]NEW[RVSON] [RVSOFF]  [RVSON] "SPC
(15)"  [RVSOFF][4" "][RVSON] [RVSOFF][6"
 "][RVSON] [RVSOFF][3" "][RVSON] [RVSOFF
][3" "][RVSON] [RVSOFF]  [RVSON][17" "]"
;                                        PO
·264 PRINT"[RVSON][21" "]"SPC(18)"  [RVSO
FF][4" "][RVSON] [RVSOFF][4" "][RVSON] [
RVSOFF][4" "][RVSON] [RVSOFF][4" "][RVSO
N] "SPC(18)" ";                          DD
·266 PRINT"[RVSON] [RVSOFF]DRAW[RVSON] [R
VSOFF]LINE[RVSON] [RVSOFF]FILL[RVSON] [R
VSOFF]TEXT[RVSON] "SPC(18)"  [RVSOFF][4"
 "][RVSON] [RVSOFF][4" "][RVSON] [RVSOFF
][4" "][RVSON] [RVSOFF][4" "][RVSON] "SP
C(18)" ";                                GH
·268 PRINT"[RVSON][41" "]"SPC(38)" ";    JL
·270 PRINT"[RVSON] [RVSOFF][3" "][RVSON][
WHITE]  [BLACK]  [RED]  [CYAN]  [PURPLE]
  [GREEN]  [BLUE]  [YELLOW]  [c 1]  [c 2
]  [c 3]  [c 4]  [c 5]  [c 6]  [c 7]  [c
 8]  [RVSOFF][WHITE][3" "][RVSON] ";     AD
·272 PRINT"[RVSON] [RVSOFF][3" "][RVSON][
WHITE]  [BLACK]  [RED]  [CYAN]  [PURPLE]
  [GREEN]  [BLUE]  [YELLOW]  [c 1]  [c 2
]  [c 3]  [c 4]  [c 5]  [c 6]  [c 7]  [c
 8]  [RVSOFF][WHITE][3" "][RVSON] ";     AD
·274 PRINT"[RVSON] "SPC(38)" [s N][38" "]
[s M]":RETURN                            IN
·276 CHAR,0,24,"[39" "]":RETURN:REM 39 SP
ACES                                     NG
·278 REM *===* INITIALIZATION *===*      LN
·280 GOSUB318:FAST:D=999:DIMC(D):W=55296:
GRAPHIC3:GRAPHIC0,1:COLOR0,1:GOSUB250:OS
=5:SC=.646:C4=1                          LD
·282 MOVSPR1,129,108:MOVSPR2,161,108:X=17
1:Y=148:C=1:Q=13:U=41:M=3:P$="[RVSON][4"
 "][DOWN][4"[LEFT]"][4" "][DOWN][4"[LEFT
]"][4" "][RVSOFF]":PC=241:C0=.:C1=1:C2=2
:C3=6:DC=C1:SPRSAV1,8                    II
·284 MOVSPR8,162,141:SLOW:RETURN         ON
·286 POKEPC,C0:CHAR,23,15,P$:POKEPC,C1:CH
AR,27,15,P$:POKEPC,C2:CHAR,31,15,P$:POKE
PC,C3:CHAR,35,15,P$:OC=.:RETURN          PO
·288 FORI=.TO2:PRINT"[WHITE][CNTRL G]";:C
HAR,0,24,E$:PRINT"[CNTRL G]";:FORT=.TO35
0:NEXT:GOSUB276:FORT=.TO10:NEXT:NEXT:RET
URN                                      MP
·290 GRAPHICM:COLOR0,C0+1:SPRITE1,.:SPRIT
E2,.:SPRITE8,.:RETURN                    LJ
·292 REM *===* INPUT ROUTINE FOR TEXT, LO
AD, AND SAVE *===*                       NC
·294 GETKEYA$:IFA$="*"ORA$="[CLEAR]"ORA$=
"[HOME]"ORA$="[DOWN]"ORA$="[UP]"ORA$="[R
IGHT]"ORA$="[LEFT]"THEN294               BE
·295 IFPOS(X)=39THENPRINT"[LEFT][CNTRL G]
";:GOTO294                               CM
·296 IFA$=CHR$(13)THENRETURN             DI
·298 IFA$=CHR$(20)ANDN$=""THEN294        LG
·300 IFA$=CHR$(20)THENL1=LEN(N$):N$=LEFT$
(N$,L1-1):PRINTA$;:GOTO294               KF
·302 PRINTA$;:N$=N$+A$:GOTO294           HO
·304 REM *===* ERROR CORRECTION *===*    GB
·306 IFDS=62THENGOSUB184                 CE
·308 GRAPHIC0:SLOW:GOSUB276:SPRSAV1,8:IFD
S>1THENE$=DS$:GOSUB288:RESUME52:REM DISK
 ERROR                                   HJ
·310 IFX1<.THENX1=.:RESUME               DA
·312 IFY1<.THENY1=.:RESUME               BO
·314 RESUME52:REM GO BACK TO MENU        HP
·316 REM *===* LOAD SPRITES AND MACHINE L
ANGUAGE ROUTINE IF NECESSARY *===*       EN
·318 IFPEEK(3584)=.ANDPEEK(3600)=48THENRE
TURN:REM ROUTINES HAVE BEEN LOADED       BI
·320 BLOAD"ART SPR",B0,P3584:BLOAD"ML",B0
,P2816:RETURN                            HN
·321 REM *===* DELAY LOOP FOR FIRE BUTTON
 PRESSES *===*                           EL
·322 FORT=.TO150:NEXT:RETURN             IK
```

MINOTAUR MAZE FROM PAGE 52

Starting address in hex: C000
Ending address in hex: C957
SYS to start: 49152

***Flankspeed* required for entry! See page 119.**

```
C000: 78 A5 01 29 FB 85 01 A9 74
C008: 00 85 FB 85 FD A9 D0 85 0D
C010: FC A9 38 85 FE A2 08 A0 BE
C018: 00 B1 FB 91 FD 88 D0 F9 A8
C020: E6 FC E6 FE CA D0 F0 A5 1C
C028: 01 09 04 85 01 58 20 B2 E7
C030: C5 20 06 C6 AD 18 D0 09 82
C038: 0E 8D 18 D0 A9 FF 8D 0F 03
C040: D4 A9 80 8D 12 D4 A9 00 5D
C048: 8D D9 02 8D DA 02 8D 20 C9
C050: D0 A2 40 A9 FF 9D 40 03 8E
```

```
C058: CA 10 FA A9 07 8D 27 D0 64
C060: A9 01 8D 17 D0 8D 1D D0 FB
C068: 8D 1B D0 A9 0D 8D F8 07 26
C070: A9 00 8D D5 02 8D D7 02 E6
C078: 8D D8 02 A9 03 8D DB 02 F8
C080: A9 04 8D D6 02 A9 93 20 F1
C088: D2 FF A9 00 20 27 C7 20 34
C090: 66 C6 A2 00 A0 00 18 20 39
C098: F0 FF A9 F2 A0 C7 20 1E CC
C0A0: AB A2 09 A0 0E 18 20 F0 CF
C0A8: FF A9 40 A0 C8 20 1E AB E5
C0B0: A2 18 A0 00 18 20 F0 FF 35
C0B8: A9 1B A0 C8 20 1E AB A9 7A
C0C0: 0E 8D B8 02 AE D5 02 E8 86
C0C8: 8A 0A 0A 8D CA 02 20 2A 0C
C0D0: C5 AE A8 02 AC A9 02 A9 F1
C0D8: 24 18 20 41 C7 CE CA 02 D9
C0E0: D0 EC 20 CA C4 20 4E C4 81
C0E8: 20 C1 C1 20 D8 C2 AD AE A4
C0F0: 02 C9 01 D0 3F AD AF 02 2D
C0F8: C9 02 D0 38 AD CB 02 D0 1A
C100: 33 EE D5 02 A9 00 8D CA FB
C108: 02 AD B1 02 0A 2E CA 02 70
C110: 0A 2E CA 02 18 6D B1 02 4E
C118: 90 03 EE CA 02 0A 2E CA 6A
C120: 02 18 6D D7 02 8D D7 02 E8
C128: AD CA 02 6D D8 02 8D D8 51
C130: 02 4C 85 C0 AD AE 02 CD F0
C138: BA 02 D0 0B AD AF 02 CD FD
C140: BB 02 D0 03 4C 57 C1 AD E4
C148: AE 02 CD C8 02 D0 43 AD 53
C150: AF 02 CD C9 02 D0 3B A9 51
C158: 00 8D 12 D4 CE D6 02 D0 45
C160: 2B A2 08 A0 27 18 20 F0 27
C168: FF A9 4B A0 C6 20 1E AB AE
C170: 20 01 C4 A2 20 8E 12 04 BD
C178: 20 D8 C2 A9 FD 85 A2 A5 A9
C180: A2 D0 FC A5 C5 C9 04 D0 FA
C188: EF 4C 70 C0 20 01 C4 4C 28
C190: 85 C0 A9 80 8D 12 D4 A2 18
C198: 20 A0 FF 88 D0 FD CA D0 4C
C1A0: F8 AD D6 02 A2 20 38 C9 E4
C1A8: 04 B0 03 8E 18 04 38 C9 0D
C1B0: 03 B0 03 8E 16 04 38 C9 12
C1B8: 02 B0 03 8E 14 04 4C E8 4A
C1C0: C0 AD AE 02 8D B6 02 AD D3
C1C8: AF 02 8D B7 02 AD 00 DC 4C
C1D0: C9 7E D0 15 AE AE 02 AC 0B
C1D8: AF 02 88 38 20 41 C7 C9 3E
C1E0: BA F0 03 CE AF 02 4C 2F 8B
C1E8: C2 C9 7D D0 14 AE AE 02 37
C1F0: AC AF 02 C8 38 20 41 C7 79
C1F8: C9 BA F0 EA EE AF 02 D0 CA
C200: E5 C9 7B D0 14 AE AE 02 6F
C208: CA AC AF 02 38 20 41 C7 92
C210: C9 BA F0 D2 CE AE 02 D0 A8
C218: CD C9 77 D0 12 AE AE 02 69
C220: E8 AC AF 02 38 20 41 C7 C8
C228: C9 BA F0 03 EE AE 02 AE EE
C230: AE 02 AC AF 02 38 20 41 D8
C238: C7 C9 24 D0 1D EE B1 02 7E
C240: CE CB 02 20 2B C4 A9 32 C8
C248: 18 6D D7 02 8D D7 02 A9 B8
C250: 00 6D D8 02 8D D8 02 20 21
C258: 4E C4 A9 00 AE CC 02 F0 83
C260: 02 A9 0F 8D B8 02 A9 23 30
C268: AE AE 02 AC AF 02 18 20 5E
C270: 41 C7 AE B6 02 EC AE 02 7E
C278: D0 0B AC B7 02 CC AF 02 39
C280: D0 03 4C AA C2 A9 20 AE 86
C288: B6 02 AC B7 02 18 20 41 21
C290: C7 A9 0A 8D 0F D4 A9 08 2F
C298: 8D 0E D4 A9 F0 8D 14 D4 1A
C2A0: A9 00 8D 13 D4 A9 81 8D 78
C2A8: 12 D4 AD AE 02 0A 0A 0A 0C
C2B0: 18 69 05 8D 00 D0 AD AE F1
C2B8: 02 38 C9 20 90 08 A9 01 20
C2C0: 8D 10 D0 4C CB C2 A9 00 B3
C2C8: 8D 10 D0 AD AF 02 0A 0A AA
C2D0: 0A 18 69 23 8D 01 D0 60 3F
C2D8: CE CE 02 30 01 60 AD DB 93
C2E0: 02 8D CE 02 AD BA 02 8D 39
C2E8: C0 02 AD BB 02 8D C1 02 68
C2F0: AE B9 02 CA 10 02 A2 03 DD
C2F8: 8E C2 02 AD C2 02 0A AA 73
C300: AD BA 02 18 7D EA C7 8D 40
C308: A8 02 E8 AD BB 02 18 7D 9C
C310: EA C7 8D A9 02 AE A8 02 55
C318: AC A9 02 38 20 41 C7 C9 9B
C320: BA D0 12 EE C2 02 AD C2 E1
C328: 02 C9 04 D0 CE A9 00 8D CE
C330: C2 02 4C FB C2 C9 24 D0 BE
C338: 03 CE CB 02 AD C2 02 8D D7
C340: B9 02 8E BA 02 8C BB 02 91
C348: A9 09 8D B8 02 A9 25 18 2A
C350: 20 41 C7 AD C0 02 CD BA 72
C358: 02 D0 0B AD C1 02 CD BB 31
C360: 02 D0 03 4C 72 C3 A9 20 82
C368: AE C0 02 AC C1 02 18 20 82
C370: 41 C7 AD C8 02 8D C3 02 45
C378: AD C9 02 8D C4 02 AE C7 BC
C380: 02 CA 10 02 A2 03 8E C5 59
C388: 02 AD C5 02 0A AA AD C8 2B
C390: 02 18 7D EA C7 8D A8 02 13
C398: E8 AD C9 02 18 7D EA C7 43
C3A0: 8D A9 02 AE A8 02 AC A9 89
C3A8: 02 38 20 41 C7 C9 BA D0 61
C3B0: 12 EE C5 02 AD C5 02 C9 B8
C3B8: 04 D0 CE A9 00 8D C5 02 5B
C3C0: 4C 89 C3 C9 24 D0 03 CE EA
C3C8: CB 02 AD C5 02 8D C7 02 63
C3D0: 8E C8 02 8C C9 02 A9 0B 37
C3D8: 8D B8 02 A9 25 18 20 41 69
C3E0: C7 AD C3 02 CD C8 02 D0 85
C3E8: 0B AD C4 02 CD C9 02 D0 D2
C3F0: 03 4C 00 C4 A9 20 AE C3 41
```

```
C3F8: 02 AC C4 02 18 20 41 C7 AF
C400: 60 A9 FF 8D 08 D4 A9 0A 28
C408: 8D 07 D4 A9 F0 8D 0D D4 7B
C410: A9 21 8D 0B D4 A2 0F A9 A3
C418: FE 85 A2 A5 A2 D0 FC CA 20
C420: 8E 08 D4 D0 F2 A9 00 8D 86
C428: 0B D4 60 A9 6E 8D 08 D4 EA
C430: A9 09 8D 0C D4 8D 0D D4 C0
C438: 8D 07 D4 A9 11 8D 0B D4 C9
C440: A9 FD 85 A2 A5 A2 D0 FC 26
C448: A9 00 8D 0B D4 60 AD D8 46
C450: 02 38 CD DA 02 F0 04 90 BA
C458: 19 B0 0B AD D7 02 38 CD BA
C460: D9 02 F0 02 90 0C AD D7 51
C468: 02 8D D9 02 AD D8 02 8D E9
C470: DA 02 A2 00 A0 05 18 20 CD
C478: F0 FF A9 90 20 D2 FF A9 40
C480: 92 20 D2 FF AD DA 02 AE 3F
C488: D9 02 20 CD BD A2 00 A0 53
C490: 22 18 20 F0 FF AD D8 02 64
C498: AE D7 02 20 CD BD A2 18 87
C4A0: A0 0D 18 20 F0 FF A9 9B BC
C4A8: 20 D2 FF A9 00 AE D5 02 CB
C4B0: E8 20 CD BD A2 18 A0 21 C1
C4B8: 18 20 F0 FF A9 9A 20 D2 19
C4C0: FF A9 00 AE B1 02 20 CD BA
C4C8: BD 60 A2 14 A9 00 9D A7 8C
C4D0: 02 9D C0 02 CA 10 F7 A9 AF
C4D8: 01 8D AE 02 A9 02 8D AF 01
C4E0: 02 A9 25 8D BA 02 A9 16 BB
C4E8: 8D BB 02 A9 25 8D C8 02 5B
C4F0: A9 02 8D C9 02 AE D5 02 7C
C4F8: E8 8A 0A 0A 8D CB 02 AE 8A
C500: D5 02 38 E0 08 90 0D AD 44
C508: DB 02 F0 03 CE DB 02 A2 29
C510: 00 8E D5 02 BD CF C8 8D 5A
C518: CC 02 D0 08 A9 01 8D 15 0D
C520: D0 4C 29 C5 A9 00 8D 15 78
C528: D0 60 AD 1B D4 38 C9 01 F9
C530: 90 F8 38 C9 25 B0 F3 8D 13
C538: A8 02 AD 1B D4 38 C9 01 83
C540: 90 F8 38 C9 17 B0 F3 8D 15
C548: A9 02 AE A8 02 AC A9 02 A5
C550: 38 20 41 C7 C9 20 D0 D2 3F
C558: 60 A2 18 A9 00 9D 00 D4 8F
C560: CA 10 FA A9 F0 8D 06 D4 39
C568: A9 11 8D 04 D4 A9 0F 8D CF
C570: 18 D4 60 AE AC 02 BD E7 C0
C578: C7 8D AD 02 8A 0A AA BD 7A
C580: E8 C7 85 02 E8 BD E8 C7 10
C588: 85 03 CE AA 02 D0 22 A9 29
C590: 18 8D AA 02 AC AB 02 38 75
C598: CC AD 02 90 05 A0 00 8C D7
C5A0: AB 02 B1 02 8D 01 D4 C8 2E
C5A8: B1 02 8D 00 D4 C8 8C AB BF
C5B0: 02 60 A9 D3 8D 14 03 A9 DE
C5B8: C5 8D 15 03 A9 28 8D 12 95
C5C0: D0 AD 11 D0 29 7F 8D 11 68
C5C8: D0 A9 81 8D 1A D0 20 59 B6
C5D0: C5 58 60 AD 19 D0 8D 19 8D
C5D8: D0 29 01 D0 07 AD 0D DC 43
C5E0: 58 4C 31 EA AD 12 D0 38 6A
C5E8: C9 3A B0 0A A9 0F 8D 21 0F
C5F0: D0 A9 3A 4C FD C5 A9 00 5F
C5F8: 8D 21 D0 A9 28 8D 12 D0 BA
C600: 20 73 C5 4C BC FE A9 D7 E2
C608: 85 FB A9 C8 85 FC A0 00 1F
C610: B1 FB F0 36 A2 00 18 0A A9
C618: 48 8A 2A AA 68 0A 48 8A 05
C620: 2A AA 68 0A 48 8A 2A AA 0F
C628: 68 85 FD C6 FD 8A 18 69 E4
C630: 38 85 FE A0 08 B1 FB 91 D4
C638: FD 88 D0 F9 A5 FB 18 69 AC
C640: 09 85 FB 90 02 E6 FC 4C 8D
C648: 0E C6 60 12 9B 47 11 9D 21
C650: 41 11 9D 4D 11 9D 45 11 92
C658: 11 11 9D 4F 11 9D 56 11 7D
C660: 9D 45 11 9D 52 00 A9 51 3F
C668: 85 FB A9 28 85 FD A9 04 EC
C670: 85 FC 85 FE A2 00 A0 00 BA
C678: A9 BA 91 FD C8 C0 27 D0 ED
C680: F9 18 A5 FD 69 28 85 FD 4B
C688: 90 02 E6 FE E8 E0 17 D0 B2
C690: E5 A0 0E A2 09 18 20 F0 F9
C698: FF A9 40 A0 C8 20 1E AB D5
C6A0: A0 00 A9 04 91 FB A9 FF 26
C6A8: 8D 0F D4 A9 80 8D 12 D4 B8
C6B0: AD 1B D4 29 03 8D CA 02 D4
C6B8: AA 0A A8 18 B9 39 C7 65 4E
C6C0: FB 85 26 B9 3A C7 65 FC 86
C6C8: 85 27 18 B9 39 C7 65 26 D3
C6D0: 85 FD B9 3A C7 65 27 85 22
C6D8: FE A0 00 B1 FD C9 BA D0 7D
C6E0: 12 8A 91 FD A9 20 91 26 8E
C6E8: A5 FD 85 FB A5 FE 85 FC 35
C6F0: 4C A6 C6 E8 8A 29 03 CD 18
C6F8: CA 02 D0 BC B1 FB AA A9 55
C700: 20 91 FB E0 04 F0 1A 8A 28
C708: 0A A8 A2 02 38 A5 FB F9 33
C710: 39 C7 85 FB A5 FC F9 3A 69
C718: C7 85 FC CA D0 EE 4C A6 DF
C720: C6 AE D5 02 BD CF C8 A0 64
C728: 00 99 00 D8 99 00 D9 99 A7
C730: 00 DA 99 00 DB C8 D0 F1 0C
C738: 60 01 00 D8 FF FF FF 28 9A
C740: 00 8D A7 02 8E A8 02 8C 3D
C748: A9 02 48 8A 08 48 98 A2 52
C750: 00 0A 48 8A 2A AA 68 0A 74
C758: 48 8A 2A AA 68 0A 48 8A 45
C760: 2A AA 68 0A 48 8A 2A AA 4F
C768: 68 0A 48 8A 2A AA 68 85 70
C770: FB 86 FC 98 A2 00 0A 48 7D
C778: 8A 2A AA 68 0A 48 8A 2A 47
C780: AA 68 0A 48 8A 2A AA 68 AD
C788: 18 65 FB 85 FB 8A 65 FC 70
C790: 69 04 85 FC 68 A8 28 90 4A
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 117 and 118 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
C798: 06 68 B1 FB 4C BE C7 68 EF
C7A0: 91 FB A5 FC 38 E9 04 85 7C
C7A8: FC A5 FB E9 00 85 FB A5 58
C7B0: FC 18 69 D8 85 FC AD B8 F0
C7B8: 02 91 FB AD A7 02 AE A8 F6
C7C0: 02 AC A9 02 60 07 77 07 01
C7C8: 77 05 47 04 B4 04 70 07 C0
C7D0: 77 05 47 04 B4 04 70 07 C8
C7D8: 77 05 47 04 B4 05 98 04 F6
C7E0: 30 04 70 04 70 07 77 22 9A
C7E8: C5 C7 00 FF 01 00 00 01 78
C7F0: FF 00 90 12 20 48 49 20 65
C7F8: 92 20 20 20 20 20 20 20 6C
C800: 20 12 20 4D 45 4E 20 92 E5
C808: 20 23 20 23 20 23 20 23 15
C810: 20 12 20 53 43 4F 52 45 DF
C818: 20 92 00 9B 20 20 4D 41 35
C820: 5A 45 20 4E 4F 2E 3E 20 0A
C828: 20 20 20 20 20 20 20 20 29
C830: 20 20 20 20 20 20 9A 12 9D
C838: 20 47 45 4D 53 20 92 00 38
C840: 9B 12 3A 3A 3A 3A 3A 3A 4B
C848: 3A 3A 3A 3A 3A 3A 3A 92 72
C850: 11 9D 9D 9D 9D 9D 9D 9D B0
C858: 9D 9D 9D 9D 9D 9D 12 3A 56
C860: 92 A0 4D 49 4E 4F 54 41 5D
C868: 55 52 A0 1F 23 9B 12 3A DA
C870: 92 11 9D 9D 9D 9D 9D 9D C5
C878: 9D 9D 9D 9D 9D 9D 9D 12 D9
C880: 3A 92 A0 A0 A0 A0 A0 A0 11
C888: A0 A0 A0 A0 A0 12 3A 92 8A
C890: 11 9D 9D 9D 9D 9D 9D 9D F0
C898: 9D 9D 9D 9D 9D 9D 12 3A 96
C8A0: 92 A0 24 A0 4D 41 5A 45 C6
C8A8: A0 24 A0 95 25 9B 12 3A B0
C8B0: 92 11 9D 9D 9D 9D 9D 9D 06
C8B8: 9D 9D 9D 9D 9D 9D 9D 12 1A
C8C0: 3A 3A 3A 3A 3A 3A 3A 3A 92
C8C8: 3A 3A 3A 3A 3A 92 00 02 80
C8D0: 06 03 0C 04 08 0A 00 01 FC
C8D8: 10 28 44 82 FE 82 82 82 5E
C8E0: 05 FE 80 80 F8 80 80 80 60
C8E8: FE 09 10 10 10 10 10 10 51
C8F0: 10 10 0D 82 C6 AA 92 82 27
C8F8: 82 82 82 0E 82 C2 A2 92 09
C900: 8A 86 82 82 0F FE 82 82 29
C908: 82 82 82 82 FE 12 FE 82 A4
C910: 82 FE 90 88 84 82 14 FE C4
C918: 10 10 10 10 10 10 10 15 9D
C920: 82 82 82 82 82 82 82 FE B0
C928: 1A FE 02 04 08 10 20 40 BF
C930: FE 23 18 18 3C 5A 99 24 D6
C938: 42 C3 24 00 00 3C 42 AD 8E
C940: 42 24 18 25 99 7E 3C 7E B6
C948: FF 99 24 66 BA 9F 00 00 C6
C950: F9 F9 00 00 9F 00 7E 00 62
```

MICRO CITY
FROM PAGE 76

```
·5 POKE56,48:POKE52,48                                  JC
·10 POKE53276,255:POKE53277,255:POKE53271
,255:POKE53285,8                                        IE
·90 IFPEEK(2039)=68THEN5100                             DO
·100 GOSUB800:POKE53280,6:PRINT"[HOME][DO
WN][DOWN][11" "]ONE MOMENT PLEASE"                      BD
·105 FORT=12288TO12927:READT2:POKET,T2:NE
XT                                                      FH
·110 GOSUB850:FORT=192TO200:FORT2=0TO60ST
EP3:FORT3=0TO2:T4=PEEK(T*64+T2+T3)                      FP
·120 T5=(T4AND3)*64+(T4AND12)*4+(T4AND48)
/4+(T4AND192)/64                                        LG
·130 POKE(T+16)*64+T2+2-T3,T5:NEXT:NEXT:N
EXT                                                     CJ
·200 GOSUB870:POKE56334,PEEK(56334)AND254
:POKE1,PEEK(1)AND251                                    KC
·205 FORT=0TO511:POKE14336+T,PEEK(53248+T
):NEXT                                                  NF
·210 FORT=0TO7:READT2:FORT3=0TO7:POKE(35+
T)*8+14336+T3,PEEK(53248+T2*8+T3)                       GI
·215 NEXT:NEXT                                          EF
·220 POKE1,PEEK(1)OR4:POKE56334,PEEK(5633
4)OR1                                                   IE
·230 POKE2039,68:GOTO5100                               JM
·800 POKE53281,1:POKE53280,2:POKE53272,21
:POKE53265,27:POKE53269,0                               PA
·810 PRINT"[CLEAR][RED][7"[DOWN]"][c M][s
 M]  [s N][c G][s P][c Y] [s N][c Y][s M
] [s O][s M] [s N][c Y][s M][5" "][s N][
c Y][s M] [s P][c Y] [c Y][s P][c Y][c Y
] [s M][s N]"                                           IN
·820 PRINT"[c M] [s M][s N] [c G][c M]  [
c G][3" "][s L][s N] [c G] [c M][5" "][c
 G][3" "][c M][3" "][c M][3" "][c M]"                  DA
·830 PRINT"[c M][4" "][c G][s @][c P] [s
M][c P][s N] [c G][s M] [s M][c P][s N][
5" "][s M][c P][s N] [s @][c P]  [c M][3
" "][c M]"                                              BM
·840 RETURN                                             IM
·850 PRINT"[HOME][11"[DOWN]"][BLUE][12" "
]CAN YOU SAVE IT?"                                      JD
·860 RETURN                                             IM
·870 PRINT"[HOME][c 4][16"[DOWN]"][BLACK]
[15" "]WRITTEN BY"                                      IH
·880 PRINT"[DOWN][10" "]DARRYL DION HAWKI
NS"                                                     OI
·890 RETURN                                             IM
·1000 REM ** PLAYER CONTROL **                          FP
·1010 JY=PEEK(56320):ONMOGOTO1110,1160                  HB
```

```
•1020 IF(JYAND16)=0THEN1410 OB
•1030 ON15-(JYAND15)GOTO1310,1360,,1260,1
260,1260,,1250,1250,1250 DO
•1040 POKE2040,192:DK=0:SD=0:GOTO1290 AI
•1100 REM ** MOVE RIGHT ** CI
•1110 X=X+SP:IFX>MX-8THENMO=2:AN=AN+1:GOT
O1160 EO
•1120 HB=HBORINT(X/256):POKE53248,XAND255
:POKE53264,HB KH
•1130 AN=(AN+1)AND3:POKE2040,192+AN:GOTO1
200 KE
•1150 REM ** MOVE LEFT ** MH
•1160 X=X-SP:IFX<24THENX=24:MO=0:GOTO1290 ND
•1170 HB=HBAND254ORINT(X/256):POKE53248,X
AND255:POKE53264,HB FL
•1180 AN=(AN-1)AND3:POKE2040,192+AN:GOTO1
200 GL
•1200 ON15-(JYAND15)GOTO1310,1360 BF
•1210 GOTO1290 GD
•1250 MO=1:GOTO1110 AH
•1260 MO=2:GOTO1160 BN
•1290 IFH1>0THENH1=H1-1 BE
•1295 GOTO3030 FF
•1300 REM ** HIGH PUNCH ** AF
•1310 IFH1THEN1290 IG
•1315 POKE2040,196:H1=2:AN=0:IFX<MX-32ORM
D=1THEN1290 HN
•1320 GOSUB4100:P2=P2-2:GOTO1290 NL
•1350 REM ** LOW PUNCH ** MD
•1360 IFH1THEN1290 IG
•1365 POKE2040,197:H1=4:AN=0:IFX<MX-32THE
N1290 CG
•1370 IFMA=0THENIFMD=0THENGOSUB4100:GOTO1
290 DN
•1380 GOSUB4100:P2=P2-3:H2=H2+INT(RND(1)*
2):GOTO1290 JD
•1400 REM ** DUCK ** GI
•1410 IF(JYAND2)=0ANDQD<8THENPOKE2040,201
:DK=1:SD=1:QD=QD+1:P1=P1+1:GOTO1290 DC
•1420 DK=1:POKE2040,198:GOTO1290 GB
•2000 REM ** COMPUTER CONTROL ** NO
•2010 MD=0:ONM2GOTO2110 DG
•2020 IFMX>X+MS*4THEN2250 MG
•2030 ONSKGOTO2560,2450,2500 FN
•2040 POKE2041,208:MD=0:GOTO2290 FE
•2100 REM ** MOVE LEFT ** MH
•2110 MX=MX-MS:IFMX<X+8THENM2=0:MX=MX+MS:
GOTO2290 PJ
•2120 HB=HBAND253OR2*INT(MX/256):POKE5325
0,MXAND255:POKE53264,HB OB
•2130 MA=(MA+1)AND3:POKE2041,208+MA:GOTO2
290 DO
•2250 M2=1:GOTO2110 OD
•2290 IFH2>0THENH2=H2-1 BN
•2295 GOTO3050 FL
•2300 REM ** HIGH PUNCH ** AF
•2310 IFH2THEN2290 IG
•2315 POKE2041,212:H2=2:MA=0:IFMX>X+32ORD
K=1THEN2290 PF
•2320 GOSUB4100:P1=P1-2:H1=H1+INT(RND(1)*
2):GOTO2290 KL
•2350 REM ** LOW PUNCH ** MD
•2360 IFH2THEN2290 IG
•2365 POKE2041,213:H2=4:MA=0:IFMX>X+32ORS
D=1THEN2290 CI
•2370 IFAN=0THENIFDK=0THENGOSUB4100:GOTO2
290 GH
•2380 GOSUB4100:P1=P1-3:H1=H1+INT(RND(1)*
3):GOTO2290 KJ
•2400 REM ** DUCK ** GI
•2410 MD=1:POKE2041,214:GOTO2290 CE
•2450 IFMX>X+4THEN2480 JD
•2460 IFINT(RND(1)*3)=0THEN2410 EN
•2470 R=INT(RND(1)*2)+1:ONRGOTO2310,2360 AF
•2480 R=INT(RND(1)*7)+1:ONRGOTO2250,2250,
2410,2310,2360 DL
•2490 GOTO2040 FL
•2500 IFMX>X+36THEN2540 AO
•2510 IFINT(RND(1)*6)=0THEN2410 BG
•2520 IFDK=0THEN2310 HB
•2530 GOTO2360 FM
•2540 R=INT(RND(1)*6)+1:ONRGOTO2250,2410,
2410 AO
•2550 GOTO2040 FL
•2560 IFMX>X+4THENR=INT(RND(1)*5)+1:ONRGO
TO2310,2360,2410,2040,2040 NL
•2570 R=INT(RND(1)*8)+1:ONRGOTO2250,2250,
2250,2410,2310,2360 KN
•2580 GOTO2040 FL
•3000 REM ** MAIN LOOP ** JI
•3010 FORQ=0TO4 JK
•3020 GOTO1010 FB
•3030 IFP2<1THEN4010 HL
•3040 GOTO2010 FG
•3050 IFP1<1THEN4000 HL
•3060 IFMO=0THENIFDK=0THENPOKE2040,192 JA
•3070 IFM2=0THENIFMD=0THENPOKE2041,208 GM
•3080 IFAN=0THENMO=0 CD
•3090 IFMA=0THENM2=0 BH
•3100 FORD=0TO100:NEXT:NEXT:GOSUB3550 EK
•3110 GOTO3010 EP
•3300 REM ** DISPLAY ** FE
•3310 POKE53265,PEEK(53265)AND239:POKE204
0,192:POKE2041,208 JN
•3320 X=60:MX=280:HB=2:H1=0:H2=0:QD=0 FC
•3330 POKE53248,X:POKE53249,160:POKE53250
,MXAND255:POKE53251,160:POKE53264,HB FJ
•3340 GOSUB7000 FA
•3350 POKE53269,3:POKE53265,PEEK(53265)AN
D239OR16:GOTO3010 NA
•3500 ONSCGOTO3610,3620,3630,3640,3650,36
70,3680,3690 HM
•3510 POKE53280,6:POKE53281,1:POKE53272,2
1:POKE53265,27:POKE53269,0 CE
•3520 PRINT"[CLEAR][BLUE][7"[DOWN]"][6" "
][s M][s N] [s N][c Y][s M] [c G] [c M][
```

```
4" "][c M][4" "][c G][s P][c Y][c M][s M
] [c G]"                                    NE
•3530 PRINT"[6" "][c M]  [c G] [c M] [c G
] [c M][4" "][c M] [s N][s M] [c G][c M]
 [c M] [s M] [c G]"                         AI
•3540 PRINT"[6" "][c M]  [s M][c P][s N]
[s M][c P][s N][4" "][c M][s N]  [s M][c
 G][s @][c P][c M]  [s M][c G]"             CP
•3545 FORT=0TO3000:NEXT:GOTO5100            HJ
•3550 PRINT"[HOME][23"[DOWN]"]";SC,RIGHT$
(" "+STR$(P1),2),,                          DA
•3555 PRINTRIGHT$(" "+STR$(P2),2)           PM
•3560 RETURN                                IM
•3610 SK=1:MS=8:P1=20:P2=25:GOTO3300        PB
•3620 SK=1:MS=12:P1=20:P2=30:GOTO3300       JM
•3630 SK=1:MS=12:P1=20:P2=35:GOTO3300       LN
•3640 SK=2:MS=8:P1=20:P2=25:GOTO3300        FO
•3650 SK=2:MS=12:P1=20:P2=25:GOTO3300       PJ
•3660 SK=2:MS=12:P1=20:P2=30:GOTO3300       JH
•3670 SK=3:MS=8:P1=20:P2=20:GOTO3300        MO
•3680 SK=3:MS=12:P1=20:P2=25:GOTO3300       CE
•3690 SK=3:MS=12:P1=20:P2=30:GOTO3300       CO
•4000 POKE2040,200:FORT=0TO2000:NEXT:GOTO
5100                                        OC
•4010 POKE2041,216:FORT=0TO2000:NEXT:SC=S
C+1:GOTO3500                                MB
•4100 POKE54277,0:POKE54278,240:POKE54273
,100:POKE54296,15:POKE54276,129             JN
•4110 POKE54276,128:RETURN                  DB
•5000 REM                                   JD
•5010 JY=PEEK(56320):SC=-((JYAND3)=3)-3*(
(JYAND1)=0)-6*((JYAND2)=0)                  JM
•5020 SP=8:EN=1:GOTO3500                    NP
•5100 GOSUB800:PRINT"[HOME][c 4][DOWN][DO
WN][11" "]PRESS FIRE BUTTON"                HA
•5110 FORT=0TO200:IF(PEEK(56320)AND16)=0T
HEN5010                                     CD
•5120 NEXT:GOSUB850:FORT=0TO300:IF(PEEK(5
6320)AND16)=0THEN5010:NEXT                  AP
•5130 NEXT:GOSUB870:FORT=0TO300:IF(PEEK(5
6320)AND16)=0THEN5010                       JM
•5140 NEXT:PRINT"[CLEAR]":FORT=0TO750:NEX
T:GOTO5100                                  HD
•7000 POKE53280,0:POKE53281,11:POKE53282,
15                                          OP
•7005 POKE53265,PEEK(53265)OR64:POKE53272
,PEEK(53272)OR14                            LJ
•7010 PRINT"[CLEAR][5" "][RED]&#[22" "][B
LUE]&[6"'"][c T][3"[SS]"]";                 DM
•7015 PRINT"[RED][4"'"]*![BLUE][22"'"]*[6
"'"][c T][4"[SS]"]";                        JF
•7020 PRINT"[c 2][3"'"][RED]'*'[BLUE][9"'
"][c 2][4"'"][BLUE][4"'"][WHITE][4"'"][B
LUE]'*[5"'"][c T][5"[SS]"]";                OB
•7025 PRINT"[c 2][3"'"][RED]'*'[BLUE][9"'
"][c 2][4"'"][BLUE][4"'"][WHITE][4"'"][B
LUE]'*[4"'"][c T][5"[SS]"][c 5][c +]";      FO
•7030 PRINT"[c 2][3"'"][RED]'*'[BLUE][9"'
"][c 2][4"'"][BLUE][4"'"][WHITE][4"'"][B
LUE]'*[3"'"][c T][5"[SS]"][c 5][c +]#";     JG
•7035 PRINT"[c 2]''([RED]'*'[BLUE][9"'"][
c 2][3"'"]([BLUE][9"'"]*''[c T][5"[SS]"]
[c 5][c +]# ";                              FF
•7040 PRINT"[c 2][3"'"][RED]'*'[BLUE][9"'
"][c 2][4"'"][BLUE][9"'"]*'[c T][5"[SS]"
][c 5][c +]#  ";                            KB
•7045 PRINT"[c 2][3"'"][RED]'*[c T][BLUE]
[9"'"][c 2][4"'"][BLUE][9"'"]*[c T][5"[S
S]"][c 5][c +]#[3" "]";                     PP
•7050 PRINT"[34"[SS]"][c 5][c +]#[4" "]";   CD
•7055 PRINT"[33"[SS]"][c 5][c +]#[5" "]";   OG
•7060 PRINT"[32"[SS]"][c 5][c +]#[6" "]";   IP
•7065 PRINT"[c 5][31"'"]*#[7" "]";          CJ
•7070 RETURN                                IM
•8192 DATA 0,0,0,0,0,0,0,0,0,0,252,0,3,21
2,0,3                                       LK
•8208 DATA 84,0,3,84,0,0,80,0,6,169,16,22
,169,16,22,169                              GO
•8224 DATA 80,5,88,64,3,252,0,2,168,0,10,
170,0,10,10,128                             DF
•8240 DATA 40,2,160,40,0,160,160,2,128,22
4,2,128,60,3,240,0                          NJ
•8256 DATA 0,0,0,0,0,0,0,0,0,0,252,0,3,21
2,0,3                                       LK
•8272 DATA 84,0,3,84,0,0,80,0,6,169,16,22
,169,16,22,169                              GO
•8288 DATA 80,5,168,64,1,124,0,2,168,0,2,
184,0,0,174,0                               LI
•8304 DATA 0,46,0,0,174,0,3,184,0,0,248,0
,0,63,0,0                                   GJ
•8320 DATA 0,0,0,0,0,0,0,0,0,0,252,0,3,21
2,0,3                                       LK
•8336 DATA 84,0,3,84,0,0,80,0,6,169,16,22
,169,16,22,169                              GO
•8352 DATA 80,5,88,64,3,252,0,2,184,0,2,1
72,0,0,168,0                                JF
•8368 DATA 2,234,0,10,138,0,42,2,128,56,2
,128,15,3,240,0                             BD
•8384 DATA 0,0,0,0,0,0,0,0,0,0,252,0,3,21
2,0,3                                       LK
•8400 DATA 84,0,3,84,0,0,80,0,6,169,16,22
,169,16,22,169                              GO
•8416 DATA 80,5,168,64,1,124,0,2,168,0,2,
186,0,2,186,0                               ON
•8432 DATA 0,174,0,15,172,0,15,160,0,12,1
60,0,0,252,0,0                              ID
•8448 DATA 0,0,0,0,0,0,0,0,0,0,252,0,3,21
2,0,3                                       LK
•8464 DATA 84,1,3,84,21,0,81,84,0,149,64,
2,148,0,6,168                               AA
•8480 DATA 0,6,168,0,3,252,0,2,168,0,10,1
70,0,10,10,128                              EJ
•8496 DATA 42,2,160,40,0,160,168,2,128,22
4,2,128,60,3,240,0                          JL
•8512 DATA 0,0,0,0,0,0,0,0,0,0,252,0,3,21
2,0,3                                       LK
```

```
•8528 DATA 84,0,3,84,0,0,80,0,0,148,0,2,1
 49,80,6,169                               BF
•8544 DATA 85,6,168,5,3,252,0,2,168,0,10,
 170,0,10,10,128                           CD
•8560 DATA 42,2,160,40,0,160,168,2,128,22
 4,2,128,60,3,240,0                        JL
•8576 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0                                         FG
•8592 DATA 0,0,0,0,0,0,0,0,0,252,0,3,212,
 0,3,84                                    FH
•8608 DATA 0,3,84,0,0,80,0,6,169,16,6,89,
 16,1,108,64                               LH
•8624 DATA 3,250,128,2,170,160,2,128,160,
 234,128,160,250,0,252,0                   MG
•8640 DATA 0,0,0,0,8,0,2,170,0,0,8,0,2,0,
 0,170                                     OG
•8656 DATA 128,0,2,0,32,0,10,168,0,0,32,0
 ,0,0,0,0                                  AP
•8672 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0                                         FG
•8688 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0                                         FG
•8704 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0                                         FG
•8720 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0                                         FG
•8736 DATA 0,63,0,0,245,0,0,213,0,0,213,0
 ,0,20,0,0                                 DA
•8752 DATA 168,10,0,154,42,128,155,170,12
 8,30,162,128,26,131,240,0                 KJ
•8768 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0                                         FG
•8784 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0                                         FG
•8800 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,2,23
 4,60                                      NF
•8816 DATA 10,233,95,10,229,87,2,182,23,2
 34,133,0,250,1,80,0                       FN
•9000 DATA105,95,223,233,160,209,229,234  ED
```

SPEEDWAY

FROM PAGE 78

Starting address in hex: C000
Ending address in hex: C8B0
SYS to start: 49152

Flankspeed **required for entry! See page 119.**

```
C000: A0 00 B9 B1 C5 99 00 3C A7
C008: B9 B1 C6 99 00 3D B9 B1 7C
C010: C7 99 00 3E C8 D0 EB 8C C1
C018: 17 D0 8C 25 D0 8C 20 D0 FF
C020: A9 03 8D 1C D0 A9 0E 8D 8C
C028: 26 D0 A0 18 B9 9E C4 99 8E
C030: 00 D4 88 10 F7 78 A9 7F 37
C038: 8D 0D DC A9 01 8D 1A D0 D2
C040: 8D 12 D0 A9 1B 8D 11 D0 E4
C048: A9 07 8D 14 03 A9 C4 8D 99
C050: 15 03 58 A9 00 8D 15 D0 DD
C058: 8D B7 C4 A9 C8 A0 C4 20 5A
C060: 1E AB A2 08 A0 0C 18 20 B9
C068: F0 FF A2 33 A9 3B A0 C5 7A
C070: 20 FD C2 84 A8 A2 04 A0 C5
C078: 1D A9 01 99 B8 D9 8A 09 FF
C080: 30 99 B8 05 38 98 E9 07 C9
C088: A8 CA D0 ED A0 03 98 09 FF
C090: F8 99 FA 07 A9 05 99 29 96
C098: D0 98 0A AA A9 96 9D 05 99
C0A0: D0 B9 67 C4 9D 04 D0 88 52
C0A8: 10 E4 A9 3C 8D 1D D0 8D 8C
C0B0: 15 D0 A2 10 A0 08 18 20 2A
C0B8: F0 FF A2 35 A9 4B A0 C5 DC
C0C0: 20 FD C2 84 04 A2 12 A0 7F
C0C8: 02 18 20 F0 FF A2 34 A9 74
C0D0: 8E A0 C5 20 FD C2 84 05 30
C0D8: B9 90 C4 8D B7 C4 B9 93 3F
C0E0: C4 85 03 A9 93 20 D2 FF 5E
C0E8: A5 04 09 F8 85 FB A9 00 BF
C0F0: 85 FC 85 FD 85 39 A9 04 63
C0F8: 85 FE A9 D8 85 3A A0 06 66
C100: 06 FB 26 FC 88 D0 F9 A2 1B
C108: 00 B1 FB 85 02 06 02 90 D5
C110: 15 98 48 8A 0A A8 A9 A0 8D
C118: 91 FD C8 91 FD A5 03 91 3A
C120: 39 88 91 39 68 A8 E8 E0 87
C128: 14 90 16 18 A5 FD 69 28 30
C130: 85 FD 85 39 A5 FE 69 00 80
C138: 85 FE 18 69 D4 85 3A A2 75
C140: 00 8A 29 07 D0 C7 C8 C0 1D
C148: 3F 90 BE A6 A8 BD 70 C4 19
C150: 8D 15 D0 A9 F1 9D F8 07 FC
C158: 9D C4 C4 A9 07 9D C0 C4 53
C160: A9 FF 9D BE C4 A9 00 9D 72
C168: C2 C4 9D BA C4 A4 05 B9 70
C170: 8D C4 9D C6 C4 A9 AB 9D DE
C178: BC C4 BD 7B C4 9D 27 D0 8D
C180: 8D 86 02 86 02 BC 7D C4 1E
C188: 88 A2 16 18 20 F0 FF A9 9C
C190: 62 A0 C5 20 1E AB A6 02 EB
C198: CA 10 B8 A4 04 B9 83 C4 D6
C1A0: 8D B8 C4 38 E9 10 8D B9 25
C1A8: C4 A2 16 A0 13 18 20 F0 03
C1B0: FF A9 6F A0 C5 20 1E AB 1A
C1B8: A0 05 20 29 C3 A2 20 8E BC
C1C0: 12 D4 E8 8E 12 D4 CE D5 AA
C1C8: 07 88 D0 EE 98 A0 02 99 EC
C1D0: 08 DC 88 10 FA AD 1E D0 E5
C1D8: AD 1F D0 20 CE C2 E6 A7 B6
C1E0: A6 A8 A5 A7 29 0F D0 16 9C
C1E8: BD 00 DC 29 0C 4A 4A A8 F5
C1F0: 18 BD F8 07 79 6B C4 29 99
```

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C1F8: 07 09 F0 9D F8 07 BD F8 4E
C200: 07 DD C4 C4 F0 18 BC C6 FA
C208: C4 D0 0B 9D C4 C4 A4 05 79
C210: B9 8D C4 9D C6 C4 DE C6 EA
C218: C4 A0 01 4C 28 C2 BD 00 73
C220: DC 29 10 4A 4A 4A 4A A8 08
C228: 18 BD BE C4 79 77 C4 85 BC
C230: 02 BD C0 C4 79 79 C4 30 5D
C238: 0C C9 08 B0 1B 9D C0 C4 05
C240: A5 02 9D BE C4 BC C0 C4 4B
C248: A5 A7 39 6F C4 D0 09 BD 9A
C250: C4 C4 29 07 A8 20 93 C2 29
C258: BC C0 C4 B9 96 C4 BC 8B F7
C260: C4 99 00 D4 A9 41 99 04 1C
C268: D4 20 8B C3 CA 30 03 4C F6
C270: E2 C1 AD 1F D0 29 03 F0 CF
C278: 03 20 73 C3 AD 1E D0 29 98
C280: 03 F0 03 20 33 C3 A2 04 35
C288: A0 00 C8 D0 FD CA D0 FA 57
C290: 4C DB C1 18 BD B8 C4 79 47
C298: 4F C4 C9 31 90 2F C9 C8 F9
C2A0: B0 2B 9D B8 C4 18 BD BC 2A
C2A8: C4 79 57 C4 85 02 BD BA 03
C2B0: C4 79 5F C4 A8 D0 07 A5 39
C2B8: 02 C9 18 B0 09 60 A5 02 5E
C2C0: C9 41 B0 09 A0 01 9D BC 81
C2C8: C4 98 9D BA C4 60 AD 0A 5B
C2D0: DC 29 0F A8 09 30 8D D2 28
C2D8: 07 AD 09 DC AA 29 F0 4A 82
C2E0: 4A 4A 4A 09 30 8D D4 07 62
C2E8: 8A 29 0F 09 30 8D D5 07 4F
C2F0: 98 F0 09 A5 A8 D0 05 68 10
C2F8: 68 4C DC C3 60 86 02 20 57
C300: 1E AB A2 00 86 C6 E8 8E 31
C308: 86 02 A5 A2 29 10 85 C7 5F
C310: A9 7D A0 C5 20 1E AB 20 A7
C318: E4 FF C9 31 90 EC C5 02 3D
C320: B0 E8 20 D2 FF 38 E9 31 FF
C328: A8 18 A5 A2 69 28 C5 A2 2B
C330: D0 FC 60 A0 00 38 AD BC A1
C338: C4 ED BD C4 85 02 AD BA 5D
C340: C4 ED BB C4 05 02 90 02 0D
C348: A0 02 AD B8 C4 CD B9 C4 62
C350: 90 01 C8 B9 87 C4 48 A8 A1
C358: A2 00 20 93 C2 18 68 69 5B
C360: 04 29 07 A8 E8 20 93 C2 9C
C368: A2 80 8E 12 D4 E8 8E 12 8A
C370: D4 A9 03 85 02 A2 00 46 62
C378: 02 90 0A A9 05 DD C0 C4 27
C380: 90 03 9D C0 C4 E8 E0 02 03
C388: 90 ED 60 A0 00 BD B8 C4 43
C390: 10 02 A0 02 BD BC C4 C9 4E
C398: A9 90 05 C9 AD B0 01 C8 C9
C3A0: BD C2 C4 19 7F C4 C9 0F 1C
C3A8: 90 2C C0 03 D0 28 BC 7D 5C
C3B0: C4 18 B9 C1 07 69 01 C9 44
C3B8: 3A 90 0B 18 B9 C0 07 69 91
C3C0: 01 99 C0 07 A9 30 99 C1 58
C3C8: 07 B9 C0 07 C9 32 90 04 E1
C3D0: A5 A8 D0 06 A9 00 9D C2 FF
C3D8: C4 60 68 68 A9 40 8D 04 4A
C3E0: D4 8D 0B D4 A9 00 85 C6 19
C3E8: A2 16 A0 0E 18 20 F0 FF 79
C3F0: A9 81 A0 C5 20 1E AB 20 8C
C3F8: 29 C3 EE 86 02 20 E4 FF 62
C400: C9 0D D0 E4 4C 53 C0 A9 96
C408: 01 8D 19 D0 A2 D6 AC B7 5E
C410: C4 AD 12 D0 10 26 AD BB 05
C418: C4 0A 0D BA C4 8D 10 D0 E1
C420: AD BC C4 8D 00 D0 AD BD 19
C428: C4 8D 02 D0 AD B8 C4 8D 06
C430: 01 D0 AD B9 C4 8D 03 D0 8F
C438: A2 01 A0 00 8E 12 D0 8C 7A
C440: 21 D0 AD 0D DC 29 01 F0 E4
C448: 03 4C 31 EA 4C BC FE FF BB
C450: 00 01 01 01 00 FF FF FF 53
C458: FF FF 00 01 01 01 00 FF 5B
C460: FF FF 00 00 00 00 00 47 A7
C468: 80 B9 F2 00 FF 01 00 00 96
C470: 01 03 07 0F 1F 3F 7F EB 54
C478: 0A FF 00 02 07 05 21 01 B2
C480: 02 04 08 BC AE B3 BF 00 6D
C488: 02 06 04 00 07 0B 1F 3D 03
C490: 0B 0C 0F 05 09 01 FF DB A1
C498: B7 93 6F 4B 27 03 51 01 1B
C4A0: 20 44 00 00 F8 51 01 20 70
C4A8: 44 00 00 F8 EF 0E 00 00 E3
C4B0: 00 09 00 00 38 03 1F 00 14
C4B8: 00 00 00 00 00 00 00 00 B8
C4C0: 00 00 00 00 00 00 00 00 C0
C4C8: 93 8E 08 0D 0D 0D 0D 20 47
C4D0: 20 20 9F D5 C3 C9 20 B2 E6
C4D8: C3 C9 20 B2 C3 AE 20 B2 7E
C4E0: C3 AE 20 B2 C3 C9 20 B2 86
C4E8: 20 20 B2 20 D5 C3 C9 20 7F
C4F0: B2 20 B2 0D 20 20 20 CA AE
C4F8: C3 C9 20 AB C3 CB 20 AB AD
C500: B3 20 20 AB B3 20 20 C2 56
C508: 20 C2 20 C2 D5 C9 C2 20 50
C510: AB C3 B3 20 CA B2 CB 0D A9
C518: 20 20 20 CA C3 CB 20 B1 A4
C520: 20 20 20 B1 C3 BD 20 B1 85
C528: C3 BD 20 B1 C3 CB 20 CA F5
C530: CB CA CB 20 B1 20 B1 20 56
C538: 20 B1 00 81 50 4C 41 59 C2
C540: 45 52 53 20 28 31 2F 32 06
C548: 29 20 00 9C 53 45 4C 45 58
C550: 43 54 20 41 20 54 52 41 51
C558: 43 4B 20 28 31 2D 34 29 EA
C560: 20 00 4C 41 50 53 11 11 D3
C568: 9D 9D 9D 05 30 30 00 9A 41
C570: 45 54 11 11 9D 9D 9D 05 0A
C578: 30 3A 30 35 00 20 9D 92 98
C580: 00 50 52 45 53 53 20 52 81
C588: 45 54 55 52 4E 00 9A 52 05
C590: 4F 41 44 20 43 4F 4E 44 AA
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 117 and 118 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
C598: 49 54 49 4F 4E 20 20 31 8E
C5A0: 3D 44 52 59 20 32 3D 57 B4
C5A8: 45 54 20 33 3D 49 43 59 B8
C5B0: 20 00 00 00 00 00 00 00 D0
C5B8: 00 00 54 10 00 69 54 00 DA
C5C0: 6A 55 00 67 D5 00 1D F4 CF
C5C8: 10 1F 69 54 57 A6 95 55 9E
C5D0: 9F A5 15 9F 94 04 6E 90 62
C5D8: 00 6A 40 01 59 00 01 54 33
C5E0: 00 00 54 00 00 10 00 00 45
C5E8: 00 00 00 00 00 00 00 00 E8
C5F0: 00 00 00 00 00 00 00 00 F0
C5F8: 00 00 00 00 00 00 00 00 F8
C600: 15 40 55 15 40 55 15 71 DB
C608: 55 05 D6 A4 1B FA 79 69 D6
C610: D9 F9 69 D9 F9 1B FA 79 B0
C618: 05 D6 A4 15 71 55 15 40 C9
C620: 55 15 40 55 00 00 00 00 20
C628: 00 00 00 00 00 00 00 00 28
C630: 00 00 00 00 00 00 00 00 30
C638: 00 00 00 10 00 00 54 00 9C
C640: 01 54 00 01 59 00 00 6A 5A
C648: 40 04 6E 90 15 9F 94 55 2A
C650: 9F A5 57 A6 95 1F 69 54 06
C658: 1D F4 10 67 D5 00 6A 55 77
C660: 00 69 54 00 54 10 00 00 82
C668: 00 00 00 00 00 00 00 00 68
C670: 00 00 00 00 00 00 00 00 70
C678: 00 00 00 54 00 14 54 50 85
C680: 15 A9 50 16 FE 50 16 FE 0A
C688: 50 16 76 50 16 9A 50 01 B7
C690: A9 00 01 99 00 0D DD C0 80
C698: 17 FF 50 15 DD 50 15 DD 36
C6A0: 50 15 A9 50 15 A9 50 00 0F
C6A8: 64 00 00 10 00 00 00 00 1D
C6B0: D9 00 00 00 00 00 00 00 8A
C6B8: 00 00 00 04 00 00 15 00 D1
C6C0: 00 15 40 00 65 40 01 A9 66
C6C8: 00 06 B9 10 16 F6 54 5A 54
C6D0: F6 55 56 9A D5 15 69 F4 57
C6D8: 04 1F 74 00 57 D9 00 55 F6
C6E0: A9 00 15 69 00 04 15 00 22
C6E8: 00 00 00 00 00 00 00 00 E8
C6F0: 00 00 00 00 00 00 00 00 F0
C6F8: 00 00 00 00 00 00 00 00 F8
C700: 55 01 54 55 01 54 55 4D F7
C708: 54 1A 97 50 6D AF E4 6F CF
C710: 67 69 6F 67 69 6D AF E4 23
C718: 1A 97 50 55 4D 54 55 01 67
C720: 54 55 01 54 00 00 00 00 1F
C728: 00 00 00 00 00 00 00 00 28
C730: 00 00 00 00 00 00 00 00 30
C738: 00 00 00 04 15 00 15 69 CF
C740: 00 55 A9 00 57 D9 04 1F 93
C748: 74 15 69 F4 56 9A D5 5A 51
C750: F6 55 16 F6 54 06 B9 10 CD
C758: 01 A9 00 00 65 40 00 15 BD
C760: 40 00 15 00 00 04 00 00 B9
C768: 00 00 00 00 00 00 00 00 68
C770: 00 00 00 00 00 10 00 00 80
C778: 64 00 15 A9 50 15 A9 50 FA
C780: 15 DD 50 15 DD 50 17 FF 1E
C788: 50 0D DD C0 01 99 00 01 20
C790: A9 00 16 9A 50 16 76 50 18
C798: 16 FE 50 16 FE 50 15 A9 22
C7A0: 50 14 54 50 00 54 00 00 FD
C7A8: 00 00 00 00 00 00 00 00 A8
C7B0: D9 FF FF F0 E0 00 70 C0 8D
C7B8: 00 30 C0 00 30 80 00 10 6A
C7C0: 80 00 10 80 F0 10 81 F8 4D
C7C8: 10 83 FC 10 83 FC 10 83 7D
C7D0: FC 10 83 FC 10 83 FC 10 FE
C7D8: 81 F8 10 80 F0 10 80 00 65
C7E0: 10 80 00 10 C0 00 30 C0 33
C7E8: 00 30 E0 00 70 FF FF F0 5B
C7F0: 12 FF FF F0 E1 F8 70 C0 FF
C7F8: F0 30 C0 00 30 80 00 10 9B
C800: 80 00 10 80 00 10 84 02 A7
C808: 10 87 0E 10 87 FE 10 87 DB
C810: FE 10 87 FE 10 87 0E 10 5B
C818: 84 02 10 80 00 10 80 00 BF
C820: 10 80 00 10 C0 00 30 C0 72
C828: F0 30 E1 F8 70 FF FF F0 85
C830: 12 FF FF F0 E0 F0 70 C0 36
C838: 60 30 C0 60 30 80 00 10 AA
C840: 80 00 10 80 00 10 80 00 E1
C848: 10 83 0C 10 87 9E 10 87 B5
C850: FE 10 87 FE 10 83 FC 10 86
C858: 80 00 10 80 00 10 80 00 F9
C860: 10 80 00 10 C0 00 30 C0 B2
C868: 00 30 E0 00 70 FF FF F0 DA
C870: 12 FF FF F0 C0 00 30 80 E4
C878: 00 10 80 00 10 80 00 10 A9
C880: 87 FE 10 81 F8 10 80 F0 13
C888: 10 C0 60 30 F0 60 F0 F8 25
C890: 61 F0 F0 60 F0 C0 60 30 76
C898: 80 F0 10 81 F8 10 87 FE 2B
C8A0: 10 80 00 10 80 00 10 80 52
C8A8: 00 10 C0 00 30 FF FF F0 9A
C8B0: 12 C2
```

THE EDITOR
FROM PAGE 56

```
·10 REM *** THE EDITOR *** BUCK CHILDRESS
  ***                                          HO
·20 REM *** P.O. BOX 13575 SALEM, OR 9730
  9 ***                                        DC
```

```
•30 PRINTCHR$(147)"LOADING AND CHECKING D
ATA LINE:":J=49152:L=100:C=11                KI
•40 PRINTCHR$(19)TAB(31)L:PRINT:FORB=0TOC
:READA:IFA<0ORA>255THEN60                    KG
•50 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN
70                                           BP
•60 PRINT"ERROR IN DATA LINE:"L:END          HL
•70 X=0:J=J+12:L=L+10:IFL<471THEN40          AI
•80 PRINT"THE DATA IS OK AND LOADED[3"."]
":PRINT                                      GI
•90 PRINT"SYS 49152 TO ACTIVATE[3"."]":EN
D                                            EG
•100 DATA120,169,22,162,192,141,20,3,142,
21,3,169,1164                                HH
•110 DATA15,162,3,141,24,212,134,252,88,9
6,173,190,1490                               AO
•120 DATA193,174,141,2,142,190,193,224,4,
240,64,224,1791                              JJ
•130 DATA5,208,11,205,190,193,240,52,32,1
77,193,76,1582                               KK
•140 DATA81,192,166,253,164,203,132,253,1
92,64,240,36,1976                            ND
•150 DATA228,203,208,17,173,139,2,197,251
,240,25,133,1816                             BF
•160 DATA251,198,252,16,19,169,3,133,252,
169,0,162,1624                               FN
•170 DATA23,157,0,212,202,16,250,169,65,1
41,4,212,1451                                DB
•180 DATA76,49,234,166,203,228,254,240,24
7,134,254,224,2309                           EE
•190 DATA64,240,241,165,207,141,189,193,1
64,211,177,209,2201                          KD
•200 DATA141,187,193,140,188,193,165,209,
133,65,165,210,1989                          GL
•210 DATA133,66,169,32,224,47,208,8,145,2
09,136,16,1393                               ON
•220 DATA251,76,151,193,224,44,208,12,145
,209,200,196,1909                            OD
•230 DATA213,144,249,240,247,76,151,193,2
24,4,208,19,1968                             FJ
•240 DATA196,213,176,165,162,9,202,240,5,
200,196,213,1977                             EE
•250 DATA144,248,132,211,76,151,193,224,5
,208,15,192,1799                             GC
•260 DATA0,240,69,162,9,202,240,238,136,2
40,235,76,1847                               EB
•270 DATA197,192,224,3,208,5,160,0,76,182
,192,224,1663                                DN
•280 DATA6,208,30,164,213,177,209,201,32,
208,19,136,1603                              JA
•290 DATA48,15,177,209,201,32,240,247,201
,160,208,5,1743                              JJ
•300 DATA173,189,193,208,238,200,76,182,1
92,224,1,208,2084                            PH
•310 DATA20,166,214,160,6,232,224,24,144,
5,240,25,1460                                NB
•320 DATA76,81,192,136,208,243,76,137,193
,224,7,208,1781                              NO
•330 DATA15,166,214,240,239,160,6,202,240
,107,136,208,1933                            HO
•340 DATA250,76,137,193,224,33,208,88,166
,214,224,24,1837                             DE
•350 DATA176,218,232,224,25,176,213,181,2
17,16,247,142,2067                           EB
•360 DATA192,193,181,217,41,128,157,194,1
93,232,224,24,1976                           LL
•370 DATA144,244,240,242,32,101,233,174,1
92,193,181,217,2193                          DG
•380 DATA41,15,73,128,149,217,172,192,193
,200,185,217,1782                            BA
•390 DATA0,41,15,24,125,194,193,153,217,0
,232,200,1394                                DE
•400 DATA224,24,144,238,240,236,165,242,4
1,15,73,128,1770                             IP
•410 DATA133,242,160,0,132,211,32,124,232
,76,151,193,1686                             EM
•420 DATA224,28,240,3,76,81,192,162,24,16
5,211,201,1607                               CB
•430 DATA40,144,3,56,233,40,168,24,32,240
,255,32,1267                                 DL
•440 DATA177,193,132,198,132,207,173,187,
193,174,189,193,2148                         PA
•450 DATA240,3,56,233,128,172,188,193,145
,65,76,81,1580                               CO
•460 DATA192,160,0,132,199,132,212,132,21
6,96,0,255,1726                              HD
•470 DATA255,1,2,3,4,5,6,0,0,0,0,0,276       NP
```

LAZY SOURCE CODE
FROM PAGE 88

Starting address in hex: C000
Ending address in hex: C7CF
SYS to start: 49152

Flankspeed **required for entry! See page 119.**

```
C000:  78  A9  3F  8D  14  03  A9  C0  70
C008:  8D  15  03  A9  21  8D  02  03  0B
C010:  A9  C0  8D  03  03  58  60  C9  90
C018:  30  D0  03  20  B3  C7  4C  31  35
C020:  EA  A9  CE  85  5F  A9  C3  85  5B
C028:  60  A9  C6  85  5A  A9  C6  85  CE
C030:  5B  A9  F8  85  58  A9  06  85  41
C038:  59  20  BF  A3  4C  83  A4  A5  2F
C040:  C5  C9  40  D0  06  8D  EA  C2  22
C048:  4C  AF  C0  CD  EA  C2  F0  5F  D0
C050:  8D  EA  C2  A2  03  DD  EB  C2  BD
C058:  F0  05  CA  10  F8  30  50  8A  2D
C060:  AE  8D  02  E0  01  D0  10  C9  2B
C068:  03  F0  3B  C9  02  F0  34  C9  52
C070:  01  F0  2A  C9  00  F0  29  C9  3A
C078:  03  F0  0C  C9  02  F0  1B  C9  1A
C080:  01  F0  14  C9  00  F0  0D  A9  F7
C088:  7B  8D  23  C1  A9  11  8D  1C  DA
C090:  C1  4C  02  C1  4C  88  C1  4C  45
```

```
C098: 95 C1 4C 9C C1 4C B7 C1 60
C0A0: 4C A3 C1 4C CB C1 4C D8 51
C0A8: C1 20 9F FF 4C 02 C1 4C 86
C0B0: 17 C0 A2 03 B9 00 C7 20 CF
C0B8: E4 C0 C8 CA D0 F6 A9 20 83
C0C0: 8D 77 02 A9 14 8D 78 02 8D
C0C8: 20 F2 C0 4C 31 EA C9 22 F0
C0D0: F0 06 20 EF C0 4C 31 EA 01
C0D8: 4C C7 C6 28 50 78 A0 C8 0E
C0E0: F0 18 40 68 8D 79 02 EE 8A
C0E8: E5 C0 EE EE C0 60 02 20 B0
C0F0: E4 C0 A9 79 8D E5 C0 AD 9B
C0F8: EE C0 85 C6 A9 02 8D EE 1D
C100: C0 60 A5 C5 C9 40 D0 06 6D
C108: 8D EA C2 4C 2B C1 CD EA 35
C110: C2 F0 18 8D EA C2 A2 12 CB
C118: DD F8 C2 F0 11 CA 10 F8 87
C120: 30 5F BC 7B C3 4C B2 C0 6B
C128: 4C 31 EA 4C A9 C0 E0 05 2D
C130: 10 03 4C 22 C1 E0 10 F0 55
C138: 08 A9 20 8D 77 02 4C 6D CA
C140: C1 A9 83 A0 C3 20 1E AB 7D
C148: A9 00 85 C6 A9 31 8D 14 BA
C150: 03 A9 EA 8D 15 03 A9 83 BA
C158: 8D 02 03 A9 A4 8D 03 03 CC
C160: A9 57 8D 24 03 A9 F1 8D 3F
C168: 25 03 4C 31 EA A9 14 8D 44
C170: 78 02 4C 78 C1 EE EE C0 10
C178: BD A3 C7 4C CE C0 4C 31 FA
C180: EA A9 00 85 C6 4C 9F C2 10
C188: A9 48 8D 23 C1 A9 05 8D 29
C190: 1C C1 4C 02 C1 A9 59 8D 0F
C198: 23 C1 10 F1 A9 6A 8D 23 44
C1A0: C1 10 EA AD 21 D0 18 69 7E
C1A8: 01 C9 10 F0 06 8D 21 D0 F9
C1B0: 4C 31 EA A9 00 90 F6 AD F7
C1B8: 20 D0 18 69 01 C9 10 F0 F6
C1C0: 06 8D 20 D0 4C 31 EA A9 57
C1C8: 00 90 F6 A9 1C 20 FC C1 F4
C1D0: 8D 3F C3 A2 FF 6C 00 03 73
C1D8: A9 08 20 FC C1 8D 43 C3 FD
C1E0: 8D 3D C3 A5 15 8D 42 C3 BD
C1E8: 8D 3C C3 A9 1F 8D 24 03 F3
C1F0: A9 C2 8D 25 03 A9 00 8D 4A
C1F8: 45 C3 10 D7 A0 C3 20 1E 8C
C200: AB 20 60 A5 86 7A 84 7B D2
C208: 20 73 00 AA F0 F3 A2 FF CD
C210: 86 3A 90 01 18 20 6B A9 AF
C218: A9 00 85 C6 A5 14 60 20 48
C220: 57 F1 08 85 FB C9 0D F0 BA
C228: 04 A5 FB 28 60 E6 C8 A5 AB
C230: C8 CD 45 C3 F0 04 30 02 F6
C238: 10 0C A9 57 8D 24 03 A9 B3
C240: F1 8D 25 03 B0 E3 A9 0D 33
C248: 20 D2 FF A5 D6 8D 3B C3 44
C250: CE 3B C3 86 FC 84 FD AD D1
C258: 42 C3 AE 43 C3 85 62 86 82
C260: 63 8E 3D C3 8D 3C C3 A2 83
C268: 90 38 20 49 BC 20 DD BD 13
C270: A2 00 BD 01 01 F0 07 9D 68
C278: 77 02 E8 4C 72 C2 E8 86 CB
C280: C6 8E 45 C3 AD 43 C3 18 AB
C288: 6D 3F C3 8D 43 C3 90 03 21
C290: EE 42 C3 A6 FC A4 FD AD 79
C298: 3B C3 85 D6 4C 29 C2 AD D9
C2A0: AD C3 C9 99 D0 06 20 BF 2C
C2A8: C2 4C AF C2 20 D4 C2 A2 84
C2B0: 00 BD AD C3 E8 9D D0 06 3D
C2B8: E0 20 D0 F5 4C 31 EA A2 8B
C2C0: 00 BD AD C3 29 7F 9D AD E3
C2C8: C3 A9 1E 9D F8 06 E8 E0 BA
C2D0: 20 D0 EE 60 A2 00 BD AD 1F
C2D8: C3 18 69 80 9D AD C3 A9 57
C2E0: 20 9D F8 06 E8 E0 20 D0 58
C2E8: ED 60 3E 04 05 06 03 23 AA
C2F0: 24 22 22 22 22 22 22 22 04
C2F8: 0A 1C 14 12 0E 15 1A 1D 9F
C300: 21 22 25 2A 24 27 26 29 2D
C308: 3E 57 48 41 54 27 53 20 16
C310: 59 4F 55 52 20 4C 49 4E 64
C318: 45 23 3A 00 0D 4A 55 4D B4
C320: 50 20 42 45 54 57 45 45 4E
C328: 4E 20 4C 49 4E 45 53 20 33
C330: 28 31 2D 32 35 35 29 3A B6
C338: 20 00 20 17 00 55 09 0C F9
C340: 04 40 00 61 0D 03 02 F0 E8
C348: 00 03 06 09 0C 0F 12 15 9C
C350: 18 1B 1E 21 24 27 2A 2D 65
C358: 30 33 36 39 3C 3F 42 45 2E
C360: 48 4B 4E 51 54 57 5A 5D F6
C368: 60 63 66 69 6C 6F 72 75 BF
C370: 78 7B 7E 81 84 87 8A 8D 88
C378: 90 93 96 99 9C 9F A2 A5 51
C380: 14 20 14 12 4F 4B 21 21 B7
C388: 20 49 27 4D 20 44 45 41 51
C390: 44 21 53 59 53 20 34 39 83
C398: 31 35 32 20 54 4F 20 52 67
C3A0: 45 56 49 56 45 20 4D 45 D3
C3A8: 21 21 00 20 20 19 0F 15 68
C3B0: 20 08 09 14 20 14 08 05 37
C3B8: 20 17 12 0F 0E 07 20 0B 51
C3C0: 05 19 2D 14 12 19 20 01 6C
C3C8: 07 01 09 0E 21 2D 20 20 76
C3D0: 20 86 B1 20 20 20 20 20 C9
C3D8: 20 20 20 86 B3 20 20 20 D3
C3E0: 20 20 20 20 86 B5 20 20 DD
C3E8: 20 20 20 20 86 B7 20 20 E7
C3F0: 20 20 20 20 20 20 81 2D 60
C3F8: 20 01 04 03 2D 2D 2D 2D D5
C400: 2D 2D 2D 03 0D 10 2D 2D 02
C408: 81 2D 2D 2D 0F 12 01 2D 60
C410: 2D 2D 2D 2D 14 01 19 2D 20
C418: 2D 2D 2D 2D 2D 81 82 2D 2B
C420: 20 01 0E 04 2D 2D 2D 2D 08
C428: 2D 2D 2D 03 10 18 2D 2D 35
C430: 82 2D 2D 2D 10 08 01 2D 80
```

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C438: 2D 2D 2D 2D 14 13 18 2D 59
C440: 2D 2D 2D 2D 2D 82 83 2D 55
C448: 20 01 13 0C 2D 2D 2D 2D 3D
C450: 2D 2D 2D 03 10 19 2D 2D 5E
C458: 83 2D 2D 2D 10 08 10 2D B8
C460: 2D 2D 2D 2D 14 18 01 2D 6F
C468: 2D 2D 2D 2D 2D 83 84 2D 7F
C470: 20 02 03 03 2D 2D 2D 2D 4D
C478: 2D 2D 2D 04 05 03 2D 2D 66
C480: 84 2D 2D 2D 10 0C 01 2D D6
C488: 2D 2D 2D 2D 14 18 13 2D A9
C490: 2D 2D 2D 2D 2D 84 85 2D A9
C498: 20 02 03 13 2D 2D 2D 2D 85
C4A0: 2D 2D 2D 04 05 18 2D 2D A3
C4A8: 85 2D 2D 2D 10 0C 10 2D 0F
C4B0: 2D 2D 2D 2D 14 19 01 2D C0
C4B8: 2D 2D 2D 2D 2D 85 86 2D D3
C4C0: 20 02 05 11 2D 2D 2D 2D AD
C4C8: 2D 2D 2D 04 05 19 2D 2D CC
C4D0: 86 2D 2D 2D 12 0F 0C 2D 39
C4D8: 2D 2D 2D 2D 23 20 2D 2D 2B
C4E0: 2D 2D 2D 2D 2D 86 87 2D FD
C4E8: 20 02 09 14 2D 2D 2D 2D DC
C4F0: 2D 2D 2D 05 0F 12 2D 2D F8
C4F8: 87 2D 2D 2D 12 0F 12 2D 68
C500: 2D 2D 2D 2D 24 20 2D 2D 53
C508: 2D 2D 2D 2D 2D 87 88 2D 27
C510: 20 02 0D 09 2D 2D 2D 2D FC
C518: 2D 2D 2D 09 0E 03 2D 2D 14
C520: 88 2D 2D 2D 12 14 09 2D 8C
C528: 13 05 0E 04 20 06 05 05 82
C530: 04 02 01 03 0B 88 89 2D 84
C538: 20 02 0E 05 2D 2D 2D 2D 22
C540: 2D 2D 2D 09 0E 18 2D 2D 51
C548: 89 2D 2D 2D 12 14 13 2D BF
C550: 20 20 14 0F 20 14 08 09 F8
C558: 13 20 20 20 20 89 8A 2D 2D
C560: 20 02 10 0C 2D 2D 2D 2D 53
C568: 2D 2D 2D 09 0E 19 2D 2D 7A
C570: 8A 2D 2D 2D 13 02 03 2D C7
C578: 20 20 01 04 04 12 05 13 EB
C580: 13 3A 20 20 20 8A 8B 2D 71
C588: 20 02 12 0B 2D 2D 2D 2D 7C
C590: 2D 2D 2D 0A 0D 10 2D 2D 99
C598: 8B 2D 2D 2D 13 05 03 2D F3
C5A0: 20 0D 2E 20 02 05 0E 0E 3F
C5A8: 05 14 14 20 20 8B 8C 2D 5B
C5B0: 20 02 16 03 2D 2D 2D 2D A0
C5B8: 2D 2D 2D 0A 13 12 2D 2D C9
C5C0: 8C 2D 2D 2D 13 05 04 2D 1E
C5C8: 03 2F 0F 20 07 01 12 07 4B
C5D0: 0F 19 0C 05 13 8C 8D 2D 64
C5D8: 20 02 16 13 2D 2D 2D 2D D8
C5E0: 2D 2D 2D 0C 04 01 2D 2D D3
C5E8: 8D 2D 2D 2D 13 05 09 2D 4C
C5F0: 20 20 20 20 13 14 15 04 B1
C5F8: 09 0F 20 20 20 8D 8E 2D BA
C600: 20 03 0C 03 2D 2D 2D 2D E6
C608: 2D 2D 2D 0C 04 18 2D 2D 12
C610: 8E 2D 2D 2D 13 14 01 2D 7B
C618: 32 32 31 20 32 31 13 14 58
C620: 20 13 14 2E 20 8E 8F 2D 01
C628: 20 03 0C 04 2D 2D 2D 2D 10
C630: 2D 2D 2D 0C 04 19 2D 2D 3B
C638: 8F 2D 2D 2D 13 14 18 2D BB
C640: 02 12 0F 0F 0B 0C 19 0E B0
C648: 2C 0E 2E 19 2E 8F 90 2D 45
C650: 20 03 0C 09 2D 2D 2D 2D 3D
C658: 2D 2D 2D 0C 13 12 2D 2D 6B
C660: 90 2D 2D 2D 13 14 19 2D E5
C668: 20 20 31 31 32 33 32 20 C2
C670: 20 20 20 20 20 90 91 2D 60
C678: 20 03 0C 16 2D 2D 2D 2D 72
C680: 2D 2D 2D 0E 0F 10 2D 2D 8F
C688: 91 2D 2D 2D 14 01 18 2D FB
C690: 2D 2D 2D 2D 84 89 85 A1 7A
C698: A1 2D 2D 2D 2D 91 20 20 C0
C6A0: 20 86 B1 20 20 20 20 20 99
C6A8: 20 20 20 86 B3 20 20 20 A3
C6B0: 20 20 20 20 86 B5 20 20 AD
C6B8: 20 20 20 20 86 B7 20 20 B7
C6C0: 20 20 20 20 20 20 FF BD 3F
C6C8: D4 C0 8D D9 C6 E0 0D 30 AA
C6D0: 03 EE DA C6 A0 00 A2 0D B4
C6D8: B9 68 C5 C9 20 F0 15 C9 7A
C6E0: 00 F0 0E C9 21 30 07 C9 CB
C6E8: 40 10 03 4C F1 C6 18 69 C2
C6F0: 40 20 E4 C0 C8 CA D0 E0 3C
C6F8: A9 C5 8D DA C6 4C C8 C0 6D
C700: 41 44 43 41 4E 44 41 53 31
C708: 4C 42 43 43 42 43 53 42 38
C710: 45 51 42 49 54 42 4D 49 5F
C718: 42 4E 45 42 50 4C 42 52 61
C720: 4B 42 56 43 42 56 53 43 76
C728: 4C 43 43 4C 44 43 4C 49 64
C730: 43 4C 56 43 4D 50 43 50 8A
C738: 58 43 50 59 44 45 43 44 8E
C740: 45 58 44 45 59 45 4F 52 A7
C748: 49 4E 43 49 4E 58 49 4E AA
C750: 59 4A 4D 50 4A 53 52 4C CD
C758: 44 41 4C 44 58 4C 44 59 B0
C760: 4C 53 52 4E 4F 50 4F 52 E1
C768: 41 50 48 41 50 48 50 50 BC
C770: 4C 41 50 4C 50 52 4F 4C D8
C778: 52 4F 52 52 54 49 52 54 03
C780: 53 53 42 43 53 45 43 53 DB
C788: 45 44 53 45 49 53 54 41 DC
C790: 53 54 58 53 54 59 54 41 27
C798: 58 54 41 59 54 53 58 54 34
C7A0: 58 41 54 58 53 54 59 41 29
C7A8: 23 24 22 22 22 22 22 22 BC
C7B0: 22 22 22 A9 00 85 5F A9 4F
C7B8: 04 85 60 A9 F8 85 5A A9 CE
C7C0: 06 85 5B A9 C6 85 58 A9 9F
C7C8: C6 85 59 20 BF A3 60 00 52
```

REBELS AND LORDS
FROM PAGE 96

```
·10 POKE52,128:POKE56,128:CLR:GOTO1260               CP
·20 PRINTD$B$;:PRINTD$DD$B$;:PRINTD$DD$DD
 $B$;:PRINTD$DD$DD$DD$B$;D$;:RETURN                  ND
·30 GOSUB50:GOTO70                                   CH
·40 POKEP1,F1:POKEG1,W1:POKEG1,W1-W:RETUR
 N                                                   BO
·50 POKEP1,F2:POKEG1,W3:POKEG1,W3-W:RETUR
 N                                                   GL
·60 POKEP1,F3:POKEG1,W1:POKEG1,W1-W:RETUR
 N                                                   OA
·70 GOSUB90:IFJF=0ANDJD=0THEN70                      LO
·80 RETURN                                           IM
·90 JD=0:JF=T1-(PEEK(T2)ANDT1):IFJF=0THEN
 110                                                 KP
·100 JD=JFANDT5:JF=JFANDT6:RETURN                    AE
·110 GETA$:IFA$=""THENRETURN                         HI
·120 JF=M:FORJD=WTO5:IFA$=MID$(O$,JD,W)TH
 ENJF=BI(JD-W)                                       OF
·130 NEXT:JF=JF-(JF<0):GOTO100                       HB
·140 POKEZY+II*SN,OY+8*R:POKEZX+II*SN,FNL
 (OX+T6*C):J=BI(SN)                                  LB
·150 POKET9,PEEK(T9)ORJ:IFFNH(OX+T6*C)>OT
 HENPOKET4,PEEK(T4)ORJ:RETURN                        BF
·160 J=T7-J:POKET4,PEEK(T4)ANDJ:RETURN               II
·170 IFA=0THENA=W:NA=W:RETURN                        EN
·180 NA=0:FORI=ATOWSTEPM:IFA(I,0)<0THENNA
 =I                                                  OJ
·190 NEXT:IFNA>0THENRETURN                           AB
·200 IFA<199THENA=A+W:NA=A:RETURN                    JN
·210 GOSUB20:PRINT"[RED] TOO MANY ARMIES-
 HIT F7/F8";:GOSUB40:GOSUB70                         IO
·220 RETURN                                          IM
·230 PRINT"[CLEAR]";:FORR=0TO18:PRINTLEFT
 $(D$,R+3);                                          BA
·240 FORC=0TO18:K=M(R,C):IFK<3THENPRINTM$
 (K);:GOTO260                                        LJ
·250 K=F(K-T3,0):PRINTCL$(K);FT$;                    KD
·260 NEXT:NEXT:IFA<WTHEN310                          KA
·270 FORI=WTOA:IFA(I,0)<0THEN300                     PG
·280 R=A(I,II):C=A(I,T3):K=M(R,C):IFK=WOR
 K>IITHEN300                                         PD
·290 K=A(I,0):PRINTLEFT$(D$,R+T3);LEFT$(R
 $,II*C+II);CL$(K);AR$;                              HC
·300 NEXT                                            IA
·310 RETURN                                          IM
·320 GOSUB90:IFJD=0THEN380                           KA
·330 IFJDANDWTHENR=(R-W)-(R<W):GOTO370               KP
·340 IFJDANDIITHENR=(R+W)+(R>17):GOTO370             IM
·350 IFJDAND4THENC=(C-W)-(C<W):GOTO370               IP
·360 C=(C+W)+(C>17)                                  NP
·370 GOSUB140                                        CN
·380 RETURN                                          IM
·390 K=0:AA(0,0)=M:AA(0,W)=0:IFM(R,C)<T3T
 HEN410                                              DI
·400 J=M(R,C)-T3:AA(0,0)=J:AA(0,W)=F(J,W)            GK
·410 IFA<WTHEN470                                    CD
·420 FORJ=WTOA:IF(A(J,0)=M)ORA(J,0)<>OW(R
 ,C)THEN460                                          CH
·430 IF(R<>A(J,II))OR(C<>A(J,T3))THEN460             GK
·440 IFA(J,4)<0THENAA(0,0)=J:AA(0,W)=A(J,
 W):GOTO460                                          FP
·450 K=K+W+(K>9):AA(K,0)=J:AA(K,W)=A(J,W)            PF
·460 NEXT                                            IA
·470 MA=AA(0,W):RETURN                               MK
·480 R=10:C=10:SN=0:GOSUB140:PRINTBB$H$"
 "PN$(PP);" HIT F8/F7, WEEK"WK;:GOSUB30              MA
·490 IFPEEK(T0)AND6THENGOSUB20:POKET9,0:R
 ETURN                                               HF
·500 PRINTBB$H$" "PN$(PP)" LOOKING (COMO
 TO END)";:GOSUB770                                  LP
·510 GOSUB320:IFJD=0ANDJF=0AND((PEEK(T0)A
 ND6)=0)THEN510                                      KL
·520 IFPEEK(T0)AND6THENGOSUB20:POKET9,0:R
 ETURN                                               HF
·530 IFJD<>0THEN500                                  BA
·540 IFMA=0THEN570                                   GN
·550 GOSUB1210:IFMS=0THEN490                         PC
·560 GOSUB1020:GOTO490                               LI
·570 PRINTBB$H$" NO TROOPS AVAILABLE-HIT
 F8/F7";:GOSUB40:GOSUB70:GOTO490                     IP
·580 QA=0:UA=M:FORI=0TONF-W:IFF(I,W)>QATH
 ENQA=F(I,W):UA=I                                    AB
·590 NEXT:UD=M:QD=0:IFA<WTHEN620                     DI
·600 FORI=WTOA:IFA(I,0)=MTHEN620                     PI
·610 IFA(I,W)>QDTHENUD=I:QD=A(I,W)                   EF
·620 NEXT                                            IA
·630 IFUA=MORQD=>QATHEN670                           NL
·640 IFF(UA,0)<>0THEN670                             HB
·650 GOSUB170:A(NA,0)=0:A(NA,W)=INT(.34*Q
 A):F(UA,W)=F(UA,W)-A(NA,W)                          GB
·660 A(NA,II)=F(UA,II):A(NA,T3)=F(UA,T3):
 A(NA,4)=M                                           NG
·670 IFA=0THENRETURN                                 AI
·680 FORI=WTOA:IFA(I,0)<>0ORA(I,4)<>MTHEN
 760                                                 NB
·690 UA=A(I,II):UD=A(I,T3):R=M:C=0                   JD
·700 FORJ=0TONF-W:IFR>MORF(J,0)>0ORRND(W)
 >.6THEN730                                          PP
·710 IFABS(F(J,II)-UA)>T3THEN730                     HD
·720 IFABS(F(J,T3)-UD)<=T3THENR=F(J,II):C
 =F(J,T3)                                            EH
·730 NEXT:IFR>MTHEN750                               PI
·740 R=INT(19*RND(2)):C=INT(19*RND(W)):IF
 (R=UA)AND(C=UD)THEN740                              JB
·750 A(I,4)=R:A(I,FI)=C                              FK
·760 NEXT:RETURN                                     EJ
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•770 GOSUB20:MA=0:L=M(R,C):IFL<T3THENONL+
 WGOTO830,890,940                                AI
•780 IFOW(R,C)<>PPTHENK=OW(R,C):PRINTPN$(
 OW(R,C))"'S CASTLE";:GOTO950                     LI
•790 PRINTCL$(PP);"[3" "]YOUR CASTLE";:GO
 SUB390                                          PM
•800 PRINTD$DD$"TROOPS:";MA;" LEVY:"F(L-T
 3,4);:IFMA>OTHENPRINTS$;                         BB
•810 IFK>OTHENGOSUB960                            LJ
•820 GOTO950                                     CO
•830 IFOW(R,C)=MTHENPRINT"[YELLOW]GRASS";
 :GOTO950                                        KO
•840 IFOW(R,C)<>PPTHENK=OW(R,C):PRINTPN$(
 K)"'S TROOPS";:GOTO950                           JN
•850 PRINTCL$(PP);"[3" "]YOUR TROOPS";:GO
 SUB390:PRINTD$DD$"IDLE TROOPS:";MA;              EO
•860 IFMA>OTHENPRINTS$;                           PN
•870 IFK>OTHENGOSUB960                            LJ
•880 GOTO950                                     CO
•890 IFOW(R,C)<>PPTHENPRINT"[c 2]WOODS";:
 GOTO950                                         NB
•900 PRINT"[c 2][3" "]YOUR TROOPS, HIDDEN
 ";:GOSUB390:PRINTD$DD$"IDLE TROOPS:";MA;         NA
•910 IFMA>OTHENPRINTS$;                           PN
•920 IFK>OTHENGOSUB960                            LJ
•930 GOTO950                                     CO
•940 PRINT"[c 4]ROCKS";                           EF
•950 RETURN                                      IM
•960 PRINTD$DD$DD$;:IFK<4THENFORI=WTOK:GO
 SUB1000:NEXT:RETURN                             LJ
•970 FORI=WTOT3:GOSUB1000:NEXT:PRINTD$DD$
 DD$DD$;                                         OE
•980 IFK<7THENFORI=4TOK:GOSUB1000:NEXT:RE
 TURN                                            EM
•990 FORI=4TO6:GOSUB1000:NEXT:RETURN              LF
•1000 PRINTRIGHT$("[5" "]"+STR$(AA(I,0)),
 FI)+AR$+MID$(STR$(AA(I,W))+"[4" "]",II,4
 );                                              LF
•1010 RETURN                                     IM
•1020 GOSUB170:IFNA=OTHENRETURN                   LE
•1030 A(NA,0)=PP:A(NA,W)=MS:A(NA,II)=RS:A
 (NA,T3)=CS:A(NA,4)=RD:A(NA,FI)=CD               GP
•1040 GOSUB20:PRINT"ARMY "NA" OF"MS" SENT
 ";                                              GP
•1050 PRINTBB$H$" HIT FB/F7 TO CONTINUE";
 :GOSUB30                                        JC
•1060 GOSUB20:PRINTBB$;:IFM(RS,CS)>IITHEN
 1090                                            GI
•1070 NK=AA(0,0):A(NK,W)=A(NK,W)-MS:IFA(N
 K,W)<WTHENA(NK,0)=M                             NG
•1080 RETURN                                     IM
•1090 NK=AA(0,0):F(NK,W)=F(NK,W)-MS:IFF(N
 K,W)<OTHENF(NK,W)=0                             CK
•1100 RETURN                                     IM
•1110 PRINTBB$H$"JS/CRSR SIZE, 0 CANCEL,
 FB/F7 END";:GOSUB20:PRINT"TROOPS 1-";MA;        EM
•1120 MS=0:GOTO1200                              CJ
•1130 GOSUB90:IF(JF=0)AND(JD=0)THEN1130          BP
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•1140 IFJF>OTHENRETURN                           FF
•1150 IFJDANDWTHENMS=MS+10:GOTO1190              II
•1160 IFJDANDIITHENMS=MS-10:GOTO1190             GN
•1170 IFJDAND4THENMS=MS-W:GOTO1190               DE
•1180 IFJDAND8THENMS=MS+W                        ME
•1190 MS=-MS*(MS=>0):IFMS>MATHENMS=MA            KG
•1200 PRINTD$DD$B$D$DD$"  SENDING"MS;:GOT
 01130                                           MM
•1210 GOSUB1110:IFMS=OTHENRETURN                 BL
•1220 RS=R:CS=C:SN=W:GOSUB140:GOSUB20            NE
•1230 PRINTBB$H$"POSITION X WITH JS/CRSR,
 THEN F7/FB";                                    EM
•1240 GOSUB320:IFJF=OTHEN1240                    MN
•1250 RD=R:CD=C:SN=0:POKET9,PEEK(T9)ANDW:
 C=CS:R=RS:GOSUB140:RETURN                       IP
•1260 GOSUB2560:GOSUB2190                        OK
•1270 FORI=OTONP:DP(I)=O:NEXT                    HE
•1280 IFNP>WTHEN1300                             KA
•1290 PP=W:GOSUB480:GOSUB580:GOSUB1390:GO
 TO1370                                          JC
•1300 FORI=WTONP:PP(I)=I:NEXT:FORI=WTONP:
 FORJ=WTONP-W:IFRND(0)>.5THEN1320                LM
•1310 QA=PP(J):PP(J)=PP(J+W):PP(J+W)=QA          GO
•1320 NEXT:NEXT:PP(0)=W                          MK
•1330 PP=PP(PP(0)):IFDP(PP)>OTHEN1350            PM
•1340 GOSUB480                                   CM
•1350 PP(0)=PP(0)+1:IFPP(0)<=NPTHEN1330          FP
•1360 GOSUB580:GOSUB1390                         MI
•1370 GOSUB2730:IFNP-DP(0)>OTHEN1280             OH
•1380 GOSUB2990:STOP                             DA
•1390 PRINTH$B$H$" HIT FB/F7 TO SEE ARMIE
 S MARCH";:GOSUB60:GOSUB70                       PJ
•1400 FORTQ=WTOFI:GOSUB1410:NEXT:WK=WK+W:
 RETURN                                          CA
•1410 IFA=0THENRETURN                            ON
•1420 NS=INT(W+A*RND(-TI)):NA=NS                 HJ
•1430 PRINTBB$H$" [BLACK]MOVING ARMIES[3"
 ."]";:NA=W-(NA<A)*NA                            PN
•1440 IFA(NA,0)<OORA(NA,4)=MTHEN1960             BE
•1450 RS=A(NA,II):CS=A(NA,T3):RD=A(NA,4):
 CD=A(NA,FI):PP=A(NA,0)                          IG
•1460 IF(RS=RD)OR(CS=CD)THENRD=RS+SGN(RD-
 RS):CD=CS+SGN(CD-CS):GOTO1490                   EG
•1470 IFRND(2)<.5THENRD=RS+SGN(RD-RS):CD=
 CS:GOTO1490                                     OL
•1480 RD=RS:CD=CS+SGN(CD-CS)                     FA
•1490 IFM(RD,CD)=2THENGOSUB2050:GOTO1910         FC
•1500 A(NA,II)=M:IFM(RS,CS)>WTHEN1530            HP
•1510 R=RS:C=CS:GOSUB390:IFMA>OORK>OTHEN1
 530                                             OH
•1520 OW(R,C)=M:IFM(R,C)=OTHENPRINTLEFT$(
 D$,R+T3)LEFT$(R$,II*C+II);BL$;                  FC
•1530 QA=A(NA,W):UA=QA:DP=OW(RD,CD):IFDP=
 MORDP=PPTHEN1890                                LH
•1540 R=RD:C=CD:GOSUB390:IFMA>OORK>OTHEN1
 600                                             NB
•1550 IFM(R,C)<2THEN1890                         EC
•1560 GOSUB20:PRINTPN$(PP)" TAKES "PN$(DP
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)"'S";                                          AF
1570 PRINTD$DD$" [BLACK]WITHOUT A FIGHT!";      CL
1580 SN=II:GOSUB140:PRINTBB$H$" HIT FB/F7 TO CONTINUE";:GOSUB60   JB
1590 GOSUB70:PRINTBB$;:POKET9,0:GOSUB20:GOTO1890   JG
1600 QD=MA:GA=.2+.35*RND(W):FF=.6:IFK>0THENFORI=WTOK:QD=QD+AA(I,W):NEXT   MI
1610 GD=.25+.3*RND(2)-.1*(M(R,C)>2):UD=QD:GOSUB2110   DE
1620 QA=INT(QA-QD*GD*FF):IFQA<0THENQA=0   DF
1630 GOSUB2150:IFQA=0THEN1780   CJ
1640 QD=INT(QD-QA*GA):IFQD<0THENQD=0   DE
1650 GOSUB2150:IFQD>0THENFF=W:GOTO1620   LD
1660 IFK=0THEN1680   EB
1670 FORI=WTOK:A(AA(I,0),0)=M:NEXT:GOSUB390:GOTO1660   NM
1680 K=AA(0,0):IFM(R,C)>2THEN1710   NM
1690 IFMA>0THENA(K,0)=M   AD
1700 GOTO1720   FH
1710 F(K,0)=PP:F(K,W)=0   ED
1720 OW(R,C)=PP:PRINTLEFT$(D$,R+T3)LEFT$(R$,II*C+II);   BH
1730 IFM(R,C)=WTHENPRINTWD$;:GOTO1760   OI
1740 IFM(R,C)>IITHENPRINTCL$(PP)FT$;:GOTO1760   OF
1750 PRINTCL$(PP)AR$;   CA
1760 GOSUB20:PRINTPN$(PP);" IS VICTORIOUS!";:GOSUB1980:A(NA,W)=QA   AA
1770 GOSUB60:GOTO1890   IE
1780 GOSUB20:PRINTPN$(DP);" REPELLS INVADERS!";:GOSUB40:GOSUB1980   LF
1790 UD=UD-QD:IFUD<=0THEN1850   PO
1800 IFK=0ORUD<=0THEN1850   GO
1810 FORI=WTOK:IFUD<=0THEN1840   IG
1820 IFAA(I,W)>UDTHENA(AA(I,0),W)=AA(I,W)-UD:UD=0:GOTO1840   FG
1830 A(AA(I,0),0)=M:UD=UD-AA(I,W)   DK
1840 NEXT:GOSUB390:GOTO1800   JC
1850 IFUD<=0THEN1880   EB
1860 IFM(R,C)>IITHENF(AA(0,0),W)=MA-UD:GOTO1880   NE
1870 A(AA(0,0),W)=MA-UD   HM
1880 A(NA,0)=M:GOTO1960   DH
1890 A(NA,II)=RD:A(NA,T3)=CD:R=RD:C=CD:OW(R,C)=A(NA,0):GOSUB2000   HG
1900 IFRD<>A(NA,4)ORCD<>A(NA,FI)THEN1960   NC
1910 R=RD:C=CD:GOSUB390:IFM(R,C)>IITHEN1940   DL
1920 IFAA(0,0)<WTHENA(NA,4)=M:GOTO1960   GO
1930 K=AA(0,0):A(K,W)=A(K,W)+QA:GOTO1950   IB
1940 K=AA(0,0):F(K,W)=F(K,W)+QA   KA
1950 A(NA,0)=M   KH
1960 IFNA<>NSTHEN1430   JB
1970 RETURN   IM
1980 POKE53280,FI:PRINTBB$H$" HIT FB/F7 TO CONTINUE";:GOSUB70   MP
1990 POKET9,0:PRINTBB$;:GOSUB20   JL
2000 PRINTLEFT$(D$,R+T3)LEFT$(R$,II*C+II);   IE
2010 IFM(R,C)=WTHENPRINTWD$;:GOTO2040   ME
2020 IFM(R,C)>IITHENPRINTCL$(OW(R,C))FT$;:GOTO2040   CB
2030 PRINTCL$(OW(R,C))AR$;   HN
2040 RETURN   IM
2050 R=RS:RD=R:C=CS:CD=C:IFA(NA,0)=0THEN2100   JN
2060 PRINTBB$H$"HIT FB/F7 TO GO ON";   LC
2070 RD=R:CD=C:IFM(R,C)=0THENSN=0:GOSUB140   LC
2080 GOSUB20:PRINTPN$(A(NA,0));"'S ARMY"NA;   AE
2090 PRINTD$DD$" UNABLE TO PROCEED";:GOSUB40:GOSUB70:POKET9,0   EJ
2100 A(NA,4)=RS:A(NA,FI)=CS:GOSUB20:PRINTBB$;:RETURN   JN
2110 CT=II:SN=II:GOSUB140:PP=A(NA,0):DP=OW(R,C):POKE53280,II   EE
2120 PRINTLEFT$(D$,R+T3)LEFT$(R$,II*C+II)CL$(PP)"[UPARROW]";:GOSUB20   LM
2130 PRINT" "PN$(PP)" ATTACKS "PN$(DP);:GOSUB2160   CN
2140 PRINTBB$H$" HIT FB/F7 TO SEE OUTCOME";:GOSUB30:PRINTBB$;:RETURN   MI
2150 POKEP2,F1:POKEG2,W2:POKEG2,W2-W   KA
2160 CT=-(CT+W)*(CT<2):POKE53289,CT:GP=[PI][UPARROW]6-LOG([PI][UPARROW]3):PRINT"[c 2]";   JH
2170 PRINTD$DD$RIGHT$("[7" "]"+STR$(QA),9)RIGHT$("[14" "]"+STR$(QD),14);   FN
2180 RETURN   IM
2190 PRINT"[CLEAR][BLACK]"   AA
2200 A$="":INPUT"LORDS (1-4)";A$:NP=VAL(A$):IFNP<WORNP>4THEN2200   GD
2210 FORI=WTONP:PRINT"LORD"I"'S NAME";:INPUTA$:PN$(I)=PN$(I)+A$:NEXT   KI
2220 A$="":PRINT"CASTLES (";T3*NP;:INPUT"-35)";A$   JL
2230 NF=VAL(A$):IFNF<T3*NPORNF>35THEN2220   NM
2240 PRINT"LEVELS: 1-NO TERRAIN":PRINT"[8" "]2-HILLS, SOME TREES"   HL
2250 PRINT"[8" "]3-HILLS AND FORESTS"   NC
2260 A$="":INPUT"LEVEL (1-3)";A$:GL=VAL(A$):IFGL<WORGL>T3THEN2260   BJ
2270 GOSUB2970   GF
2280 PRINT"[CLEAR][BLUE]PLACING [YELLOW]GRASS &";:FORI=0TO18:FORJ=0TO18:M(I,J)=0:OW(I,J)=M   IL
2290 NEXT:PRINT"&";:NEXT:IFGL=WTHEN2360   HO
2300 PRINT:PRINT"[c 4]ROCKS %";:J=6:FORI=0TO18:IFRND(0)<.2THEN2330   NL
2310 IFRND(T3)>.2THENM(I,J)=II   EA
2320 IFRND(W)>.2THENM(I,J+W)=II   ON
2330 J=INT(J-.2+1.9*RND(2)):IFJ<4THENJ=4   IH
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•2340 IFJ>14THENJ=14                                PH
•2350 PRINT"%";:NEXT                                PK
•2360 IFGL=WTHEN2400                                KM
•2370 PRINT:PRINT"[c 2]TREES #";:FORI=WTO
50                                                  CB
•2380 R=INT(19*RND(T3)):C=INT(19*RND(W)):
IFM(R,C)<>0THEN2380                                 GA
•2390 M(R,C)=W:PRINT"#";:NEXT                       KC
•2400 IFGL<T3THEN2420                               ME
•2410 FORKK=WTOFI:I=INT(T3+12*RND(9)):J=I
NT(T3+12*RND(6)):GOSUB2520:NEXT                     CO
•2420 PRINT:PRINT"[RED]CASTLES [ ]";:FORI=
0TONF-W:KK=0:IFI<NPTHENKK=I+W                       CE
•2430 R=INT(19*RND(0)):C=INT(19*RND(T3)):
IFM(R,C)>WTHEN2430                                  HB
•2440 F(I,II)=R:F(I,T3)=C:F(I,K)=KK:M(R,C
)=I+T3:OW(R,C)=KK:PRINT"[ ]";:NEXT                  CK
•2450 GOSUB230:PRINTD$;"OK (Y/N)?";:GOSUB
50                                                  DC
•2460 GETA$:IFA$<>"Y"ANDA$<>"N"THEN2460             PA
•2470 IFA$="N"THEN2280                              LI
•2480 GOSUB20:FORI=0TONF-W:IFF(I,0)>0THEN
2500                                                KN
•2490 K=.09+1.3*RND(W):F(I,4)=W+INT(W/K):
F(I,W)=INT(T5*RND(W)+RND(II)/K):GOTO2510            HJ
•2500 F(I,4)=7+NP:F(I,W)=INT(20+NF+15*RND
(W)+II*(ABS(9-F(I,II))+ABS(9-F(I,T3))))             KD
•2510 NEXT:RETURN                                   EJ
•2520 FORR=I-4TOI+4:FORC=J-4TOJ+4:IFR<0OR
R>18ORC<0ORC>18THEN2550                             ID
•2530 IFM(R,C)<>0THEN2550                           BH
•2540 K=8-ABS(I-R)-ABS(J-C):IFRND(II)<K/1
0THENM(R,C)=W                                       GH
•2550 NEXT:PRINT"#";:NEXT:RETURN                    IG
•2560 O=0:W=1:II=2:M=-1:I=0:J=0:R=0:C=0:Q
A=0:JF=0:JD=0:K=0:KK=0:RR=0:T1=31:FI=5              IE
•2570 T2=56320:T3=3:T4=53264:T5=15:T6=16:
T7=255:T8=256:T9=53269:T0=653:WK=1                  MD
•2580 W2=129:W1=21:W3=17:P1=54273:F1=50:F
2=100:F3=150:G1=54276:G2=54283                      FF
•2590 ZX=53248:ZY=ZX+1:O$="[UP][DOWN][LEF
T][RIGHT][F7]":DEFFNH(K)=INT(K/T8):DEFFN
L(K)=K-T8*FNH(K)                                    ID
•2600 DIMM(18,18),CL$(4),BI(7),M$(2),A(19
9,5),F(35,4),OW(18,18),PN$(4)                       BG
•2610 FORI=0TO4:CL$(I)=MID$("[BLACK][RED]
[YELLOW][CYAN][WHITE]",I+W,W):PN$(I)=CL$
(I):NEXT:PN$(0)="[BLACK]REBEL"                      GL
•2620 B$="[38" "]":DD$="[DOWN]":BB$="[HOM
E] "+B$                                             HC
•2630 FT$="[ ]":AR$="[UPARROW][BACKARROW]"
:WD$="[c 2]##":RK$="[c 4]%%":BL$="[YELLO
W]&&":H$="[HOME]":M$(0)=BL$:M$(W)=WD$               LL
•2640 PRINT"[CLEAR][8"[DOWN]"]"SPC(11)"RE
BELS[DOWN]":PRINTSPC(14)"AND":PRINTSPC(1
4)"[DOWN]LORDS"                                     DH
•2650 M$(II)=RK$:FORI=0TO7:BI(I)=II[UPARR
OW]I:NEXT:OX=30:OY=57:GOSUB2890                     CI
•2660 FORI=0TOII:POKE34808+I,I:POKE53287+
I,6:NEXT:POKE53285,6:POKE53275,0                    LC
•2670 POKE53276,0:POKE53277,0:POKET9,0:PO
KE53271,0:POKE53280,FI:POKE53281,FI                 JG
•2680 FORI=WTO199:A(I,0)=M:NEXT:A=0:D$="[
HOME][RIGHT][20"[DOWN]"]"                           NI
•2690 R$="[LEFT][39"[RIGHT]"]":FORI=54272
TO54300:POKEI,0                                     AP
•2700 S$=D$+DD$+LEFT$(R$,27)+"(FB/F7-SEND
)"                                                  GB
•2710 NEXT:POKE54296,143:POKE54287,102:PO
KE54292,240:POKE54290,17:POKE54285,246              JH
•2720 POKE54278,250:POKE54280,50:RETURN             FJ
•2730 FORI=0TONF-W:F(I,W)=F(I,W)+F(I,4):N
EXT                                                 BM
•2740 GOSUB20:PRINTBB$H$" HIT FB/F7 TO GO
 ON, CTRL TO QUIT";                                 DJ
•2750 GOSUB90:IFPEEK(T0)AND6THEN2780                MP
•2760 IFJF=0THEN2750                                KL
•2770 PRINTBB$;:RETURN                              EH
•2780 PRINTBB$H$" CRSR/JS FOR PLAYER, FB/
F7 TO QUIT"D$" -1 FOR NONE, 0 FOR ALL";             GB
•2790 MS=M                                          KE
•2800 PRINTD$DD$"  "MS"  ";:GOSUB90:IFJF>
0THEN2830                                           NE
•2810 IFJD>0THENMS=MS+W:IFMS>NPTHEN2790             GM
•2820 GOTO2800                                      FH
•2830 IFMS=MTHENGOSUB20:PRINTBB$;:RETURN            EE
•2840 IFMS=0THENDP(0)=NP:PRINTBB$;:GOSUB2
0:RETURN                                            HK
•2850 IFA>0THENFORI=WTOA:IFA(I,0)=MSTHENA
(I,0)=0                                             KJ
•2860 NEXT:FORI=0TONF-W:IFF(I,0)=MSTHENF(
I,0)=0                                              GF
•2870 NEXT:FORR=0TO18:FORC=0TO18:IFOW(R,C
)=MSTHENOW(R,C)=0                                   MB
•2880 NEXT:NEXT:GOSUB230:DP(MS)=W:DP(0)=D
P(0)+W:GOTO2740                                     IB
•2890 BA=40960:SA=ZX:POKE56334,PEEK(56334
)AND254:POKEW,PEEK(W)AND251                         NB
•2900 FORI=0TO1023:POKEI+BA,PEEK(I+SA):NE
XT                                                  IO
•2910 POKEW,PEEK(W)OR4:POKE56334,PEEK(563
34)ORW                                              BK
•2920 BA=40960:READSA:IFSA<0THEN2940                PF
•2930 SA=BA+8*SA:FORI=SATOSA+7:READJ:POKE
I,J:NEXT:GOTO2920                                   HL
•2940 BA=32768:READSA:IFSA<0THEN2960                NK
•2950 SA=BA+64*SA:FORI=SATOSA+63:READJ:PO
KEI,J:NEXT:GOTO2940                                 MA
•2960 RETURN                                        IM
•2970 POKE56578,PEEK(56578)ORT3:POKE56576
,(PEEK(56576)AND252)ORW                             OD
•2980 POKE648,132:POKE53272,(PEEK(53272)A
ND240)OR8:RETURN                                    ML
•2990 POKE56578,PEEK(56578)ORT3:POKE56576
,(PEEK(56576)AND252)ORT3                            CO
•3000 POKE648,4:POKE53272,(PEEK(53272)AND
```

```
240)OR4:PRINT"[CLEAR]":RETURN                HF
·3010 DATA27,,102,102,63,60,60,60,,29,,10
2,102,252,60,60,60,0,30,240,128,237          BO
·3020 DATA246,246,109,255,,31,,,182,219,2
19,182,254,,38,,5,2,80,32,10,4,0             DD
·3030 DATA35,216,115,22,124,24,24,124,,37
,34,119,239,239,126,253,239,255,-1           BC
·3040 DATA0,255,255,240,255,255,240,240,,
240,240,,240,240,,240,240,,240               CH
·3050 DATA240,,240,240,,240,255,255,240,2
55,255,240,,,,,,,,,,,,,,,,0                  AC
·3060 DATA0,,,,,,,,,,,,,,,,1,15,255,,3,2
52,,195,252,48,255,15,240,252,3,240          MP
·3070 DATA252,3,240,255,15,240,195,252,48
,3,252,,15,255,,,,,,,,,,,,,,,,,0             CB
·3080 DATA0,,,,,,,,,,,,,,,2,227,12,112,
113,152,224,,,,248,1,240,,,,,,0              KC
·3090 DATA248,1,240,,,,113,152,224,227,12
,112                                         EO
·3100 DATA0,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
,,,,-1                                       GP
```

MOUSE IN THE HOUSE

FROM PAGE 55

```
·10 REM     ********************             OP
·20 REM     *MOUSE IN THE HOUSE*             JG
·30 REM     *    BY JC HILTY   *             KE
·40 REM     ********************             OP
·50 V=53248:Q=54272:CS=0:MS=0:LP=0:TM=100
0                                            LJ
·60 GOSUB1200                                FA
·70 DIMS$(4),S(6):S$(0)="[HOME][DOWN][DOW
N]"                                          PD
·80 FORX=1TO4:S$(X)=S$(X-1)+"[5"[DOWN]"]"
:NEXT                                        PA
·90 FORX=0TO6:S(X)=X*5+2:NEXT:A$="[RVSON]
[WHITE][c *][sEP][DOWN][LEFT][LEFT][RVSO
FF][c 7][c U][c U]"                          EN
·100 PRINT"[CLEAR]":POKE53280,0:POKE53281
,15                                          CE
·110 FORX=56257TO56294:POKEX,2:NEXT:FORX=
1985TO2022:POKEX,160:NEXT                    BO
·120 PRINTTAB(1)"[RVSON][RED][38" "]"        II
·130 FORX=1TO22:PRINT"[RVSON]"TAB(1)" "TA
B(38)" ":NEXT                                LP
·140 PRINT"[HOME]"TAB(5)TM;TAB(15)"[BLUE]
MOUSE "MS;TAB(27)"[RED]CAT "CS               MD
·150 GOSUB800                                CI
·160 POKEV+39,8:POKEV+40,11:POKEV+41,6:PO
KE2040,197:POKE2041,192:POKE2042,196         ML
·170 FORX=50435TO50438:POKEX,0:NEXT:POKE5
0688,6                                       IF
·175 Y=INT(RND(9)*140)+80:POKEV+1,Y          DB
·180 POKEV+0,255:POKEV+2,58:POKEV+3,76:PO
KEV+16,4:POKEV+4,46                          FE
·190 POKEV+5,76:POKEV+21,7:POKE50432,6       GC
·195 W1=PEEK(V+30):W2=PEEK(V+31)             OE
·199 REM    MAIN LOOP                        PK
·200 JY=PEEK(56321)AND15                     HM
·202 IFJY=7THENPOKE50435,1:POKE50436,0:PO
KE50688,2:POKE2041,192:GOTO210               GL
·204 IFJY=11THENPOKE50435,255:POKE50436,0
:POKE50688,2:POKE2041,194:GOTO210            NM
·206 IFJY=13THENPOKE50435,0:POKE50436,1:P
OKE50688,2:GOTO210                           PB
·208 IFJY=14THENPOKE50435,0:POKE50436,255
:POKE50688,2:GOTO210                         PM
·210 JG=PEEK(56320)AND15                     IL
·212 IFJG=7THENPOKE50437,1:POKE50438,0:PO
KE50688,4:POKE2042,195:GOTO220               AO
·214 IFJG=11THENPOKE50437,255:POKE50438,0
:POKE50688,4:POKE2042,196:GOTO220            IE
·216 IFJG=13THENPOKE50437,0:POKE50438,1:P
OKE50688,4:GOTO220                           CG
·218 IFJG=14THENPOKE50437,0:POKE50438,255
:POKE50688,4:GOTO220                         DB
·220 TM=TM-1:PRINT"[HOME][RED]"TAB(6)"[4"
 "]":PRINT"[HOME]"TAB(5)TM:IFTM=0THEN500    JH
·225 LP=LP+1:IFLP=50THENPOKEV+39,5           FI
·226 IFLP>70 THENGOSUB300                    AL
·227 W1=PEEK(V+30):IFW1AND2THEN350           GI
·228 W2=PEEK(V+31):IFW2>1THEN400             PM
·230 GOTO200                                 BO
·300 R=INT(6*RND(5)+1):ONRGOSUB302,303,30
4,305,306,307                                FO
·301 Y=INT(RND(6)*140)+80:POKEV+1,Y:POKEV
+39,8:LP=0:RETURN                            EO
·302 POKEV+0,55:RETURN                       DN
·303 POKEV+0,95:RETURN                       CB
·304 POKEV+0,135:RETURN                      GI
·305 POKEV+0,175:RETURN                      FE
·306 POKEV+0,215:RETURN                      HB
·307 POKEV+0,255:RETURN                      HN
·349 REM    MOUSE COLLISION                  NP
·350 POKE50432,0:IFW1>3THEN370               GF
·352 POKEV+21,6:FORL=0TO24:POKEQ+L,0:NEXT
:POKEQ+24,143:POKEQ+5,16:POKEQ+19,16         EH
·354 POKEQ+6,252:POKEQ+20,249                NI
·355 FORT=0TO10:POKE2041,193:POKEQ+4,21:P
OKEQ+18,17:POKEQ+1,68:POKEQ+15,42            HL
·356 FORI=0TO100:NEXT:POKE2041,192:POKEQ+
4,20:POKEQ+18,16:FORI=0TO100:NEXT:NEXTT      MH
·358 MS=MS+10:PRINT"[HOME][BLUE]"TAB(21)M
S:POKEV+21,0:LP=0:GOTO150                    FG
·370 POKEV+21,5:FORL=0TO24:POKEQ+L,0:NEXT
:POKEQ+24,15:POKEQ+5,80:POKEQ+6,243          JC
·372 POKEQ+3,4                               CP
·374 FORT=0TO8:POKE2042,195:POKEQ+4,65:FO
RI=20TO80STEP5:POKEQ+1,I:NEXT                AL
·376 POKE2042,196:POKEQ+4,64:FORI=0TO50:N
EXT:NEXTT                                    JO
·380 CS=CS+10:PRINT"[HOME][RED]"TAB(31)CS
:POKEV+21,0:LP=0:GOTO150                     MO
```

```
•399 REM    SCREEN COLLISIONS                   GK
•400 POKE50432,0                                AG
•402 IFW2AND2THENK=40:GOSUB420:CS=CS+10:P
 RINT"[HOME][RED]"TAB(31)CS:POKEV+21,0:GO
 TO150                                          FE
•404 K=41:GOSUB420:MS=MS+10:PRINT"[HOME][
 BLUE]"TAB(21)MS:POKEV+21,0:GOTO150             PC
•420 FORL=0TO24:POKEQ+L,0:NEXT:POKEQ+24,1
 5:POKEQ+5,80:POKEQ+6,243:POKEQ+3,7             NL
•422 FORT=50TO17STEP-1:POKEQ+4,65:POKEV+K
 ,2:POKEQ+1,T:FORDR=1TO20:NEXTDR                HD
•424 POKEV+K,1:FORDR=1TO10:NEXTDR:NEXTT:P
 OKEQ+4,64:LP=0:RETURN                          EG
•499 REM    GAME OVER                           OH
•500 POKE50432,0:PRINT"[CLEAR]":POKEV+21,
 0:POKE53281,0:POKE53280,0                      KF
•505 POKEV+23,6:POKEV+29,6:POKEV+2,80:POK
 EV+3,80:POKEV+16,0:POKEV+4,255                 KD
•506 POKEV+5,80:POKE2041,192:POKE2042,196
 :POKEV+21,6                                    OE
•510 PRINT"[6"[DOWN]"]"TAB(12)"[CYAN]G A
 M E  O V E R":PRINT:PRINT                      GG
•515 PRINTTAB(12)"[BLUE]MOUSE SCORE "MS:P
 RINT:PRINTTAB(12)"[RED]CAT SCORE "CS:PRI
 NT:PRINT                                       EN
•520 GOSUB900:PRINTTAB(12)"[YELLOW]PLAY A
 GAIN  Y OR N"                                  NK
•525 GET JK$:IFJK$<>""THEN525                   ND
•530 GET P$:IFP$=""THEN530                      HF
•535 IFP$="Y"THEN545                            IO
•540 END                                        IC
•545 TM=1000:MS=0:CS=0:LP=0:POKEV+23,0:PO
 KEV+29,0:POKEV+21,0:GOTO100                    LL
•799 REM    SET TRAPS                           AL
•800 PRINT"[HOME][DOWN]":FORX=1TO22:PRINT
 TAB(2)"[36" "]":NEXT                           BK
•810 L=INT(RND(9)*10)+15                        ED
•820 FORX=0TOL:H=INT(RND(5)*7):CO=INT(RND
 (9)*5)                                         KO
•830 PRINTS$(CO)TAB(S(H))A$:NEXT                MG
•840 RETURN                                     IM
•899 REM    MUSIC                               BC
•900 RESTORE                                    IO
•905 FORX=0TO24:POKEQ+X,0:NEXT:POKEQ+24,1
 5                                              HP
•910 POKEQ+6,240:POKEQ+13,240:POKEQ+20,24
 0                                              DF
•920 READN1,N2,N3,N4,N5,N6,DR:IFN1=0THENR
 ETURN                                          OH
•925 POKEQ+1,N1:POKEQ+8,N3:POKEQ+15,N5:PO
 KEQ,N2:POKEQ+7,N4:POKEQ+14,N6                  BJ
•930 POKEQ+4,17:POKEQ+11,17:POKEQ+18,17:F
 ORZ=1TODR/4:NEXTZ                              CG
•935 POKEQ+4,16:POKEQ+11,16:POKEQ+18,16:F
 ORT=1TO20:NEXTT:GOTO920                        BO
•940 DATA 36,208,0,0,0,0,500,36,208,0,0,0
 ,0,500,30,245,0,0,0,0,500                      BA
•945 DATA 36,208,0,0,0,0,500,41,83,30,245
 ,24,146,500,36,208,0,0,0,0,500                 BJ
•950 DATA 30,245,24,146,18,104,1000             AJ
•955 DATA 30,245,0,0,0,0,500,27,148,0,0,0
 ,0,1000,46,99,32,204,27,148,500                OE
•960 DATA 30,245,0,0,0,0,500,27,148,0,0,0
 ,0,1000                                        MG
•965 DATA 36,208,0,0,0,0,500,36,208,0,0,0
 ,0,500,36,208,0,0,0,0,500                      BP
•970 DATA 30,245,0,0,0,0,500,36,208,0,0,0
 ,0,500                                         BC
•975 DATA 41,83,30,245,24,146,500,36,208,
 0,0,0,0,500,30,245,24,146,18,104,1000          HN
•980 DATA 27,148,0,0,0,0,500,46,99,32,204
 ,27,148,500                                    GJ
•985 DATA 30,245,0,0,0,0,500,27,148,0,0,0
 ,0,500                                         LD
•990 DATA 24,146,0,0,0,0,1000,30,245,24,1
 46,18,204,1000,0,0,0,0,0,0,0                   KP
•1190 REM    TITLE SCREEN                       NG
•1200 POKE53281,0:POKE53280,0                   ED
•1205 PRINT"[CLEAR]"TAB(3)"[RVSON][c 3][3
 4" "]"                                         OO
•1210 PRINTTAB(3)"[RVSON] M O U S E  I N
  T H E  H O U S E "                            CL
•1215 PRINTTAB(3)"[RVSON][34" "]":PRINT         DD
•1220 PRINTTAB(16)"[RVSON][c 8]  [RVSOFF]
 [3" "][RVSON]  ":PRINTTAB(15)"[RVSON][4"
  "][RVSOFF] [RVSON][4" "]"                     KC
•1225 PRINTTAB(15)"[RVSON][4" "][RVSOFF]
 [RVSON][4" "]":   PRINTTAB(16)"[RVSON]
 [RVSOFF][3" "][RVSON]  ":PRINTTAB(17)"[R
 VSON][4" "]"                                   GL
•1230 PRINTTAB(16)"[RVSON][3" "][RVSOFF][
 WHITE][sEP][RVSON][c 8] [RVSOFF][WHITE][
 sEP]":PRINTTAB(16)"[RVSON][c 8][8" "][RE
 D] "                                           GC
•1235 PRINTTAB(10)"[RVSON][c 8] [RVSOFF][
 5" "][RVSON][8" "]":   PRINTTAB(10)"[RVS
 ON][3" "][RVSOFF]  [RVSON][4" "]"              DA
•1240 PRINTTAB(12)"[RVSON] [RVSOFF]  [RVS
 ON]  [c 4] [c 8] ":PRINTTAB(10)"[RVSON][
 3" "][RVSOFF]  [RVSON]  [c 4] [c 8] "          FC
•1245 PRINTTAB(10)"[RVSON] [RVSOFF][4" "]
 [RVSON] [c 4]  [c 8]  ":PRINTTAB(10)"[RV
 SON] [RVSOFF][3" "][RVSON][6" "]"              OJ
•1250 PRINTTAB(10)"[RVSON] [RVSOFF][3" "]
 [RVSON][6" "]":PRINTTAB(10)"[RVSON][7" "
 ][RVSOFF]  [RVSON]  "                          LB
•1255 PRINTTAB(15)"[RVSON][3" "][RVSOFF]
 [RVSON][3" "]":PRINT                           HM
•1260 PRINTTAB(1)"[CYAN]THERE ARE A LOT O
 F TRAPS AROUND HERE!!"                         AI
•1265 PRINTTAB(4)"BUT I SURE DO LOVE THAT
  CHEESE!!"                                     BJ
•1270 GOSUB900                                  DB
•1280 PRINTTAB(6)"[RVSON][YELLOW] PLEASE
 WAIT..READING DATA "                           OM
•1285 FORX=50880TO51116:READA:POKEX,A:NEX
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T                                                   ND
·1286 FORX=50433T050438:POKEX,0:NEXT:POKE
50432,0:SYS51104                                    KJ
·1287 FORX=12288T012670:READA:POKEX,A:NEX
T                                                   ML
·1288 RETURN                                        IM
·1290 DATA 169,255,45,0,198,240,16,169,0,
141,0,198,162,21,189,0,197,157,0,198                OC
·1295 DATA 202,208,247,162,1,169,1,141,80
,197,173,80,197,45,0,197,240,3,76                   GF
·1300 DATA 243,198,232,232,14,80,197,208,
238,76,49,234,169,0,29,0,197,208,3,76               OB
·1305 DATA 97,199,169,128,61,0,197,240,48
,254,0,198,208,40,222,255,207,76,144                FO
·1310 DATA 199,80,197,45,16,208,208,12,17
3,16,208,13,80,197,141,16,208,76,43                 EA
·1315 DATA 199,173,16,208,77,80,197,141,1
6,208,189,0,197,157,0,198,76,97,199,222             FC
·1320 DATA 0,198,208,40,254,255,207,208,2
9,173,80,197,45,16,208,208,12,173,16                GC
·1325 DATA 208,13,80,197,141,16,208,76,91
,199,173,16,208,77,80,197,141,16,208                LC
·1330 DATA 189,0,197,157,0,198,169,0,232,
29,0,197,208,3,76,140,199,169,128,61,0              EA
·1335 DATA 197,240,11,254,0,198,208,20,22
2,255,207,76,134,199,222,0,198,208                  CM
·1340 DATA 9,254,255,207,189,0,197,157,0,
198,202,76,233,198,169,255,221,255                  IE
·1345 DATA 207,240,3,76,43,199,173,80,197
,76,17,199,120,169,192,141,20,3,169                 CK
·1350 DATA 198,141,21,3,88,96                       AF
·1355 REM     SPRITE DATA                           IB
·1360 DATA 0,0,0,0,0,0,0,0,0,0,198,0,1,23
9,0,1,239,0,0,198,0,0,120,0,0,236,0                 PH
·1365 DATA 32,255,128,56,255,0,9,224,0,57
,160,0,33,160,0,33,48,0,35,240,0                    MM
·1370 DATA 35,240,0,63,152,0,1,220,0,0,0,
0,0,0,0,0                                           CG
·1375 DATA 0,0,0,0,0,0,0,0,0,0,198,0,1,23
9,0,1,239,0,0,198,0,0,120,0,0,236,0                 PH
·1380 DATA 32,255,128,224,254,0,129,236,0
,225,166,0,33,163,0,33,48,0,35,240,0                DO
·1385 DATA 35,240,0,63,224,0,0,112,0,0,0,
0,0,0,0,0                                           LD
·1390 DATA 0,0,0,0,0,0,0,0,0,0,99,0,0,247
,128,0,247,128,0,99,0,0,30,0,0,55,0                 GM
·1395 DATA 1,255,0,0,255,28,0,7,144,0,5,1
56,0,5,132,0,12,132,0,15,196,0,15,196               PG
·1400 DATA 0,25,252,0,59,128,0,0,0,0,0,0,
0                                                   ED
·1405 DATA 0,0,0,0,0,0,7,248,0,4,8,0,6,8,
0,2,0,0,3,0,64,1,0,120,1,240,108                    PE
·1410 DATA 1,248,252,1,255,252,3,255,192,
3,255,192,3,255,192,7,255,192                       DC
·1415 DATA 7,192,224,7,240,124,7,240,60,0
,0,0,0,0,0,0,0,0,0                                  BP
·1420 DATA 0,0,0,0,0,0,0,31,224,0,16,32,0
,16,96,0,0,64,2,0,192,30,0,128                      JD
·1425 DATA 54,15,128,63,31,128,63,255,128
,3,255,192,3,255,192,3,255,192                      CG
·1430 DATA 3,255,224,7,3,224,62,15,224,60
,15,224,0,0,0,0,0,0,0,0,0,0                         KM
·1450 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,7,255,192,6,255,224,7,254,112                 LO
·1455 DATA 7,254,112,7,59,240,7,63,240,7,
255,176,7,255,240,5,231,144                         EI
·1460 DATA 7,231,144,3,253,240,3,255,240,
0,0,0,0,0,0,0,0,0                                   JK
```


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$360 DATA 0,0,0,0,0,0,0,0,0,0,198,0,1,23
9,0,1,239,0,0,198,0,0,120,0,0,236,0                 PH
·1365 DATA 32,255,128,56,255,0,9,224,0,57
,160,0,33,160,0,33,48,0,35,240,0                    MM
·1370 DATA 35,240,0,63,152,0,1,220,0,0,0,
0,0,0,0,0                                           CG
·1375 DATA 0,0,0,0,0,0,0,0,0,0,198,0,1,23
9,0,1,239,0,0,198,0,0,120,0,0,236,0                 PH
·1380 DATA 32,255,128,224,254,0,129,236,0
,225,166,0,33,163,0,33,48,0,35,240,0                DO
·1385 DATA 35,240,0,63,224,0,0,112,0,0,0,
0,0,0,0,0                                           LD
·1390 DATA 0,0,0,0,0,0,0,0,0,0,99,0,0,247
,128,0,247,128,0,99,0,0,30,0,0,55,0                 GM
·1395 DATA 1,255,0,0,255,28,0,7,144,0,5,1
56,0,5,132,0,12,132,0,15,196,0,15,196               PG
·1400 DATA 0,25,252,0,59,128,0,0,0,0,0,0,
0                                                   ED
·1405 DATA 0,0,0,0,0,0,7,248,0,4,8,0,6,8,
0,2,0,0,3,0,64,1,0,120,1,240,108                    PE
·1410 DATA 1,248,252,1,255,252,3,255,192,
3,255,192,3,255,192,7,255,192                       DC
·1415 DATA 7,192,224,7,240,124,7,240,60,0
,0,0,0,0,0,0,0,0,0                                  BP
·1420 DATA 0,0,0,0,0,0,0,31,224,0,16,32,0
,16,96,0,0,64,2,0,192,30,0,128                      JD
·1425 DATA 54,15,128,63,31,128,63,255,128
,3,255,192,3,255,192,3,255,192                      CG
·1430 DATA 3,255,224,7,3,224,62,15,224,60
,15,224,0,0,0,0,0,0,0,0,0,0                         KM
·1450 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,7,255,192,6,255,224,7,254,112                 LO
·1455 DATA 7,254,112,7,59,240,7,63,240,7,
255,176,7,255,240,5,231,144                         EI
·1460 DATA 7,231,144,3,253,240,3,255,240,
0,0,0,0,0,0,0,0,0                                   JK
```


PROGRAMS NEEDED

Ahoy! is constantly in search of the finest utility, productivity, and game programs available. Send your best original work on disk, accompanied by a program printout, documentation, and a stamped, self-addressed envelope to: *Ahoy!* Program Submissions, Ion International Inc., 34 West 34th Street—Suite 407, New York, NY 10001.

Continued from page 14

Y-NOT? ($15.00), a 6' "Y" cable for the serial port, contains one male 6-pin plug and two female 6-pin jacks and can be used to operate two printers or to separate the disk drive and the printer to opposite sides of the computer.

The *80 Mono Cable* ($9.00) produces an 80-column mono display from the C-128 on any composite color or monochrome monitor.

All prices include shipping to US or Canada; add $3.00 for COD. MD residents add 5%.

Master Software, 301-922-2962 (see address list, page 14).

C-64 ANIMATION

Consisting of three integrated modules that provide access to the graphics, music, and animation capabilities of the 64 and 128, *Cyber Video* ($39.95) makes it possible to create an animation with hi-res color graphics, sprites, text, music, and sound effects.

The Graphics module provides color mixing, a sprite editor, and standard drawing features like zoom, copying, and outline filling. Pictures are compressed before they are saved so more can be stored on a disk.

The Music module has staffs for three voices, with its editor automatically aligning notes and inserting measure bars. Changes in tempo, volume, octave, time, key, and voice are noted on the score. The user also controls ADSR patterns and filter parameters.

The Animation module permits the loading of picture and song files created with the other two modules. Sprites can then be put into motion over desired paths at desired rates. Included is a demo disk ($5.00 separately—deductible if you buy the full program), a 96-page manual, and an unconditional money back guarantee.

Touchstone, 206-667-9290 (see address list, page 14).

MULTIFINDER

Featuring an editor specially designed to handle text data, the *Multifinder* database manager ($39.95) performs searches in disk drive RAM, eliminating slow data transfer through the serial bus. Field lengths are not defined, and can be of any length up to 248 characters. An interactive demo is available for $2.00.

Knowledgeware, 904-371-6523 (see address list, page 14).

AMIGA BIZ GRAPHICS

Impact ($199.95) allows text, graphics, and icons to be combined in desktop video production of slides for visual annual reports, data analysis, and the like. Its four modules include a Graph Builder (create bar, line, area, scattergram, and pie charts, and display them stacked, overlapped, horizontally or vertically, or in 3-D), Table Builder (text editor supporting multiple fonts and point sizes, and bold, italic, underlining, and shadow effects), Icon Builder (create symbols to connote values on charts, and company logos or initials), Slide Builder (final editing board for combining graphs, icons, tables, and other drawing tools for use in a slide show), and Show Builder (combine slides in any order and choose style of "wipe" from up, down, left, right, fade, spiral, random, and trickle). Slides can be switched automatically or by the mouse.

Aegis Development, Inc., 213-306-0735 (see address list, page 14).

OUTLINE PROCESSOR

The *Thoughtform* outline processor ($35.00) supports headlines nested 200 levels deep. Each headline can have a block of text attached to it, and can be collapsed or expanded to hide or reveal detail. All or part of the outline can be printed out, to any depth specified.

Thoughtform (see address list, page 14).

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